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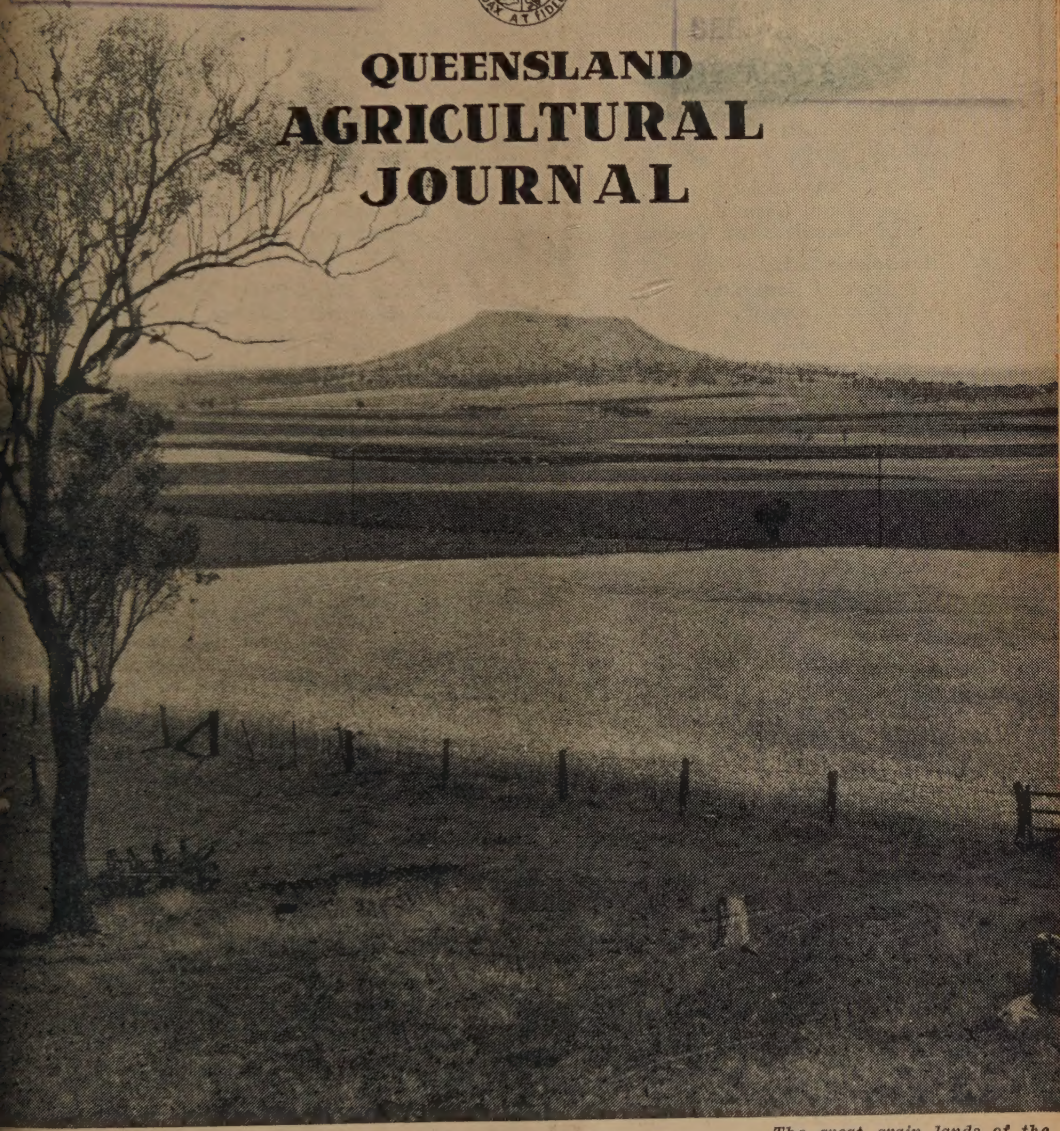
DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



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The Year in Agriculture

The Beef Industry in the U.S.A.

Harvesting, Handling, and Packing Pineapples

The Growing of Green Manure Crops

Army Worm and Other Noctuid Outbreaks

Grass Webworm in Atherton Tableland Pastures

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Volume 65 Part 6

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
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Volume 65 1 DECEMBER, 1947 Part 6

Event and Comment.

Veterinary Services.

CO-OPERATION among farmers has frequently solved shortage of man power, stated the Minister for Agriculture and Stock (Hon. H. H. Collins) in the course of a recent announcement. At the present time, he said, there is a world-wide shortage of veterinary surgeons, and the position in Queensland is comparable with that of other countries. It is therefore obvious that existing veterinary services, whether they are governmental or private, should be used to the best advantage of the stock owners generally. It is suggested also that for such operations as calfhood vaccination with Strain 19 for protection against contagious abortion, farmers should co-operate to arrange for a large number of calves to be available on the one day in any particular district, so that the visit of the veterinary surgeon will be worth while and the whole of his time occupied. Government veterinary officers are not always available for this work, but if sufficient calves can be made available the Department may be able to arrange for a private veterinary surgeon to carry out the work.

Crossbred Sheep.

A SCHEME to foster the breeding of crossbred sheep in Queensland was announced by the Minister for Agriculture and Stock (Hon. H. H. Collins) recently. Mr. Collins pointed out that the fat lamb raising in this State is as yet a small industry, and its development is seriously retarded by the shortage of crossbred ewes suitable as lamb mothers. The "ideal" mother is the ewe from a first cross between a Merino ewe and a longwool ram such as a Border Leicester, Romney Marsh, or Corriedale; accordingly, assistance is to be given to a limited number of sheep raisers who wish to introduce rams of these breeds

into what might be regarded as the marginal lamb-growing areas. It is anticipated that the male offspring from such crossbreeding can be turned off by the farmer as heavy weight lamb or young mutton.

The assistance envisaged may take the form of a subsidy for the purchase of longwool flock rams, or may involve the actual purchase of the rams by the Department and their subsequent use by farmers. In the latter case, however, recipients of sheep will be called upon to enter into an agreement not to sell any surplus female offspring other than as fat lamb mothers in recognised lamb-raising areas.

The objects of the scheme, said Mr. Collins, are to improve the quality of lambs produced in Queensland as well as to increase production of lamb.

The Tobacco Industry.

IN the course of a recent radio interview, the Minister for Agriculture and Stock, Hon. H. H. Collins, remarked that as circumstances had compelled us to cut down on our dollar expenditure, an unparalleled opportunity to expand our production of tobacco leaf had presented itself. Having all the essential requirements of the tobacco plant and the capacity to produce leaf comparable with the world's best, there was no reason, he said, why, in due time, the home demand should not be fully supplied. Production could be increased by adding to the present acreage, by getting more from every acre in established tobacco districts and by extending tobacco growing to other districts where the soils and climate were suitable and where there was enough water to irrigate the crop. The Minister added a note of caution, however, on the ground that the position with which we are now faced does not call for the wholesale production of any sort of leaf on unsuitable soil types by inexperienced growers who might misguidedly think that they now had a splendid opportunity of "making hay (or tobacco) while the sun shines." Too many, bidding to cash in on a scarcity, had made that mistake in past years.

In any plan for increasing production, the objective should be an all-round improvement in the quality of the leaf, said Mr. Collins. Of equal importance was the continuity of high quality production which, in turn, would mean stability within the industry. Seasonal conditions would, of course, always influence leaf quality, particularly that of rain-grown crops. The advantages of irrigation were obvious, but there was more in irrigation than merely watering the tobacco plant and the quality and yield of a crop depended a lot on how, when and in what volume water was applied. The quality of the water and its effect on particular soil types also had to be considered. Such details as colour, structure and composition of the leaf also were of great importance in determining the commercial value of the product. In all these things Queensland tobacco growers were assured of the technical advice and assistance of the Department of Agriculture and Stock, from the selection of suitable tobacco land to the preparation of cured leaf for market.

Continuing, Mr. Collins said that during the past 20 years the Department had carried out much research and extension work. The Department and the growers were closely associated in the industry and, in collaboration with the Council for Scientific and Industrial Research, it was now engaged on a concentrated effort to increase the production of the best quality leaf with the object of growing sufficient ultimately to meet the domestic demand and of ensuring the future of tobacco growing as a great Australian industry.

A Home Made Level.

A. F. SKINNER, Soil Conservation Officer, Bureau of Investigation of Land and Water Resources.

Making the Level.

THIS home made level (Plate 130) consists essentially of a large "U" tube (made from two glass tubes connected with a rubber hose). When this is partly filled with water or spirit, and when both ends are open, the surface levels of the fluid in the two vertical glass columns will be similar, irrespective of the angle or position of either the base board or the tripod stand.

When the base board, on which the "U" tube assembly is mounted, is rotated around its central pivot it will be apparent that the surface levels of the two opposite columns of fluid will also rotate on the one horizontal plane, even if the base board is not level. It will thus be seen that the device is self-levelling and that, in the field, a succession of levels can be determined from any one station without making any adjustment to the instrument.

The diameter of the glass tubes should be sufficient to facilitate free movement of the fluid used and thereby to eliminate possible error due to adhesion of the water to the surface of the tubes. A minimum internal diameter of an inch is suggested for this reason, although satisfactory results have been obtained with slightly smaller sized tubes. Certain types of long and narrow bottles, such as are commonly used for castor or olive oils, may be used if other material is not available. In such cases the bottoms should be removed, the bottles inverted, and the necks inserted through the holes in the base board. The distance between these holes and also the dimensions of the base board, as shown in the diagram, are approximate only, and may be modified slightly if necessary without losing efficiency.

If desired the fluid may be coloured to facilitate visual work.

Using the Level.

In use, levels are sighted across the tops of the two opposite columns of fluid in the glass tubes on to a sighting target on a graduated staff. No attempt should be made to sight *through* the glass. Turn the base board to a slightly diagonal position and sight *between* the two columns as shown in Plate 131 (lower right hand corner).

To set out either contour or grade lines or for other levelling work the standard practice of taking backsights and foresights is followed.

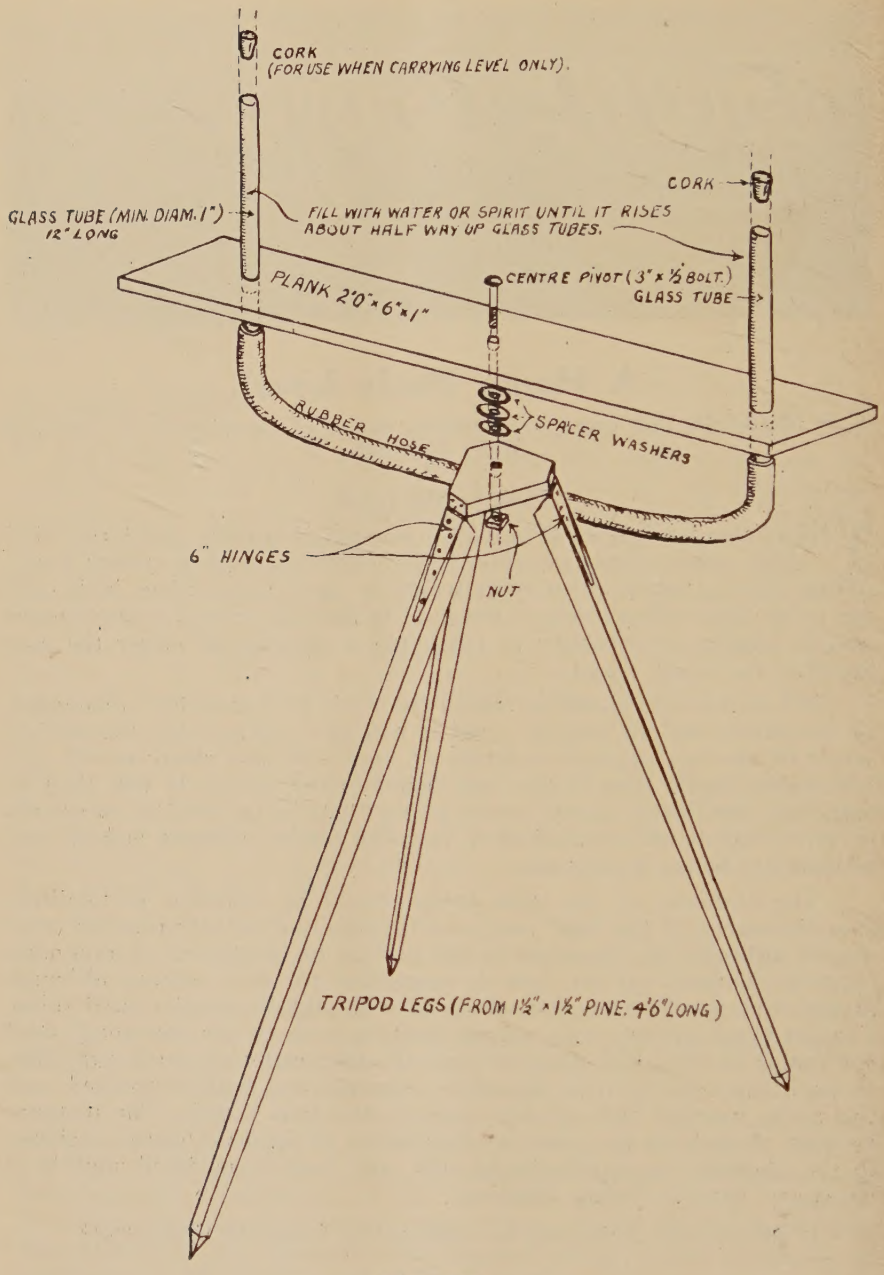

Plate 130.

If a contour (level) line is required the staff (bearing the sighting target in an approximately central position) is held in an upright position by an assistant at a selected starting point. The level is then set in a position in the field at a distance of several hundred feet from the staff and from where the line of sight over the surface levels of the columns of fluid approximately intersects the target. Several trials may

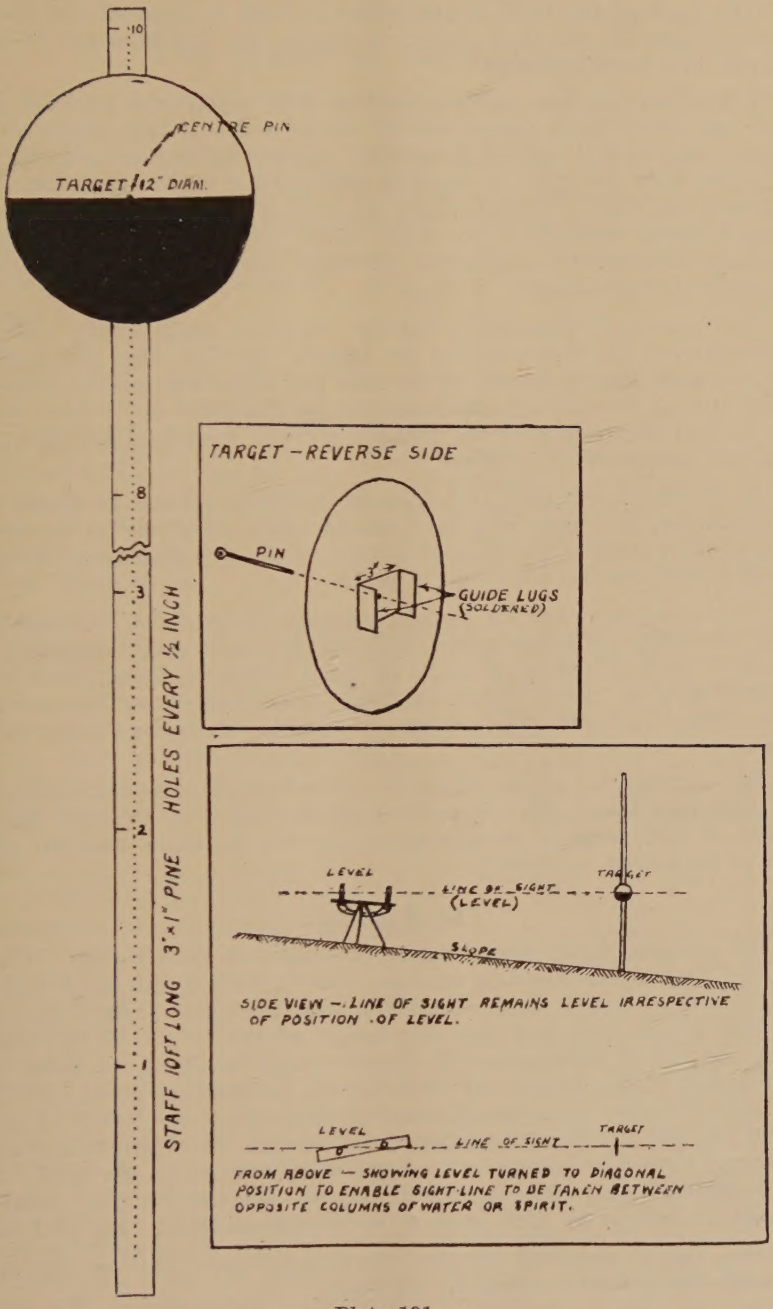

Plate 131.

at first be necessary before a suitable station is located. The next step is to adjust the position of the target on the staff until the line of sight intersects the exact centre of it. The target is attached to the staff by means of a wire pin. It also has two guiding brackets on it to prevent it from rotating on this pin.

The back of the staff is graduated in half inches and the position of the target on the staff should be noted by the assistant after its position has been adjusted.

After marking the starting position with a peg or a piece of white paper (a roll of toilet paper carried at the waist is time-saving in this respect) the staff is carried forward a measured distance (e.g. 100 ft.) and again held upright. A sight is again taken by the operator of the level and the staff is moved either up or down the slope until the line of sight again intersects the exact centre of the target. The latter obviously must not be moved on the staff when plotting a succession of points of equal height.

The process is repeated a number of times until finally difficulty is encountered in clearly seeing the target. At this stage the assistant with the staff should remain at the last peg while the level is moved to a new station beyond the staff A new position for the target on the staff is then determined in the manner already described and the whole procedure is repeated as before.

It is mentioned that the distance between points at which staff measurements are made will vary considerably according to the degree of accuracy required, the general nature of the topography of the land, and also with the condition of its surface.

For accurate work on broken ground intervals of 50 feet, with some interspace measurements, will satisfy most requirements. On unbroken rolling downs or on open plain country, very much wider spacings may be used. When locating true contours, as distinct from grade lines, the uniform spacing of points of measurement is not necessary.

For setting out grade lines the procedure is somewhat similar to that described above, but the position of the target on the staff must be altered at each point of measurement and the distances between points must be measured accurately.

An Example.

To indicate more precisely the procedure to be followed let it be assumed that it is desired to set out a line with a gradient of 3 inches per 100 feet of length, that the selected starting point is to be the lower terminal of the line, and that the height of the target on the staff at which the line of sight intersects its centre is 5 ft. 7½ in. A point to be located at a radial distance of 50 feet from the starting point will therefore require to be 1½ inches higher than that point; at 100 ft., 3 inches higher; at 150 ft., 4½ inches higher, and so on. To obtain this gradient the target should be *lowered* a corresponding amount on the staff. That is, it should be lowered from 5 ft. 7½ in. (at the starting point) to 5 ft. 4½ in. before the first point at a distance of 100 ft. can be located.

If a fall is required the procedure is reversed, that is, the target is *raised* the desired amount on the staff.

Proportionate adjustments should be made for the measurement of the elevation of points at distances either greater or less than 100 feet.

With a little practice both speed and accuracy can be developed in using this level which, although lacking many of the advantages of more expensive precision instruments, will, nevertheless, serve many useful purposes on any farm or pastoral holding.

The Year in Agriculture.

In his report to the Minister, Hon. H. H. Collins, M.L.A., the Under Secretary, Mr. Arthur F. Bell, presented a comprehensive review of the activities of the Department of Agriculture and Stock for the year ended 30th June last, together with a general appraisal of the agricultural and livestock situation in Queensland. Subjoined is a summary of Mr. Bell's report.

SEASONAL CONDITIONS.

THE April-September period of 1946 was exceptionally dry and without sufficient rain for successful sowings of seasonal crops. Some relief came in late September with soaking rains over the south-eastern division. Lighter falls were recorded in some pastoral districts, but, except for isolated showers, there were few beneficial falls in other parts of Queensland.

Aggregate rain registrations in October were below normal throughout the State. Fairly well distributed storms occurred in some of the southern agricultural areas, but in other districts only very light rainfalls were recorded. November was a month of storm rains over a wide expanse of the far-western pastoral country. In the South-west, however, there was practically no break in the protracted dry weather. Local thunderstorms improved the seasonal outlook in agricultural and dairying districts. December rainfall was below normal in most divisions of the State.

In January the rainfall distribution was light over most of the pastoral districts, but under cyclonic influences there were very heavy downpours in the south-eastern division. In some localities registrations were phenomenal and there were serious inundations in the basins of seaward-flowing rivers. February was another month of excessive rainfall aggregates and consequent high floods in the coastal districts. The South-west had the best rains for years, which altered entirely the pastoral outlook in that region. A second heavy flood series commenced in the coastal districts near the end of the month and continued into the first week in March. March also was a month of generous rains and the South-west again shared in the benefit, some streams reaching flood reporting levels. Throughout other divisions of the State most rivers and their tributaries were either in flood or flowing strongly. There were flood rises in most of the coastal river systems and also in the basins of some inland streams. April rainfall was above normal in the South Coast, Moreton, and Darling Downs divisions and caused more local flooding. The most useful May rains fell late in the month and extended from the seaboard to the Warrego and central highlands. In the wheatgrowing areas sowings for grain commenced on a record acreage—500,000—for Queensland.

At the close of the year, seasonal prospects were good as a result of the late summer rains and recent freshening falls and in most districts stock were wintering well. Light to useful rains in southern

and far south-western pastoral districts spread eastwards through the Warrego, Maranoa, and Darling Downs divisions to the South Coast, but, except on the tropical coast, gaugings were below the light to moderate July averages. Normal dry winter weather was the general experience; however, crop prospects were promising in every farming district.

PLANT INDUSTRY.

A perusal of the several reports covering the activities of the Division of Plant Industry will show that, in spite of the somewhat unsatisfactory nature of the seasonal conditions, a great deal of useful work was carried out by the officers handling both the investigational and advisory services.

Many crops grown in Queensland are either produced commercially nowhere else in Australia or are predominantly Queensland-grown. As a consequence, the Department of Agriculture and Stock has, in large measure, to rely on its own efforts to solve the problems of these crops and in handling them can draw only to a limited extent on experience gained elsewhere. This has led to the building up of a considerable team of workers recruited specially for investigational work. Much of the work of some of these officers can be done in the Head Office laboratories in Brisbane and, to some extent, in co-operation with farmers, orchardists, and market gardeners on their own properties. On the other hand, many of the projects on which it is desired to concentrate their efforts can best—and in some cases can only—be satisfactorily handled on departmentally controlled properties. It was for this reason that the recent departmental reorganization provided for the establishment of a number of regional experiment stations with which are now associated several branch stations. The important part played by these various stations in the departmental investigational programme is very evident from this year' annual report; and the plans which have been prepared for their further development imply that, within the course of a few years, each of these several stations will function as a major centre of plant industry activities within its district.

Soy Bean.—The potential importance of the soy bean in Queensland's rural economy has led to the establishment of observation plots in various districts, these plots containing well over 100 varieties. The report of the Commonwealth Commission of Investigation into the Soy Bean Industry in the United States of America—one of whose members was the Director of Agriculture—has now been made available. It contains a very comprehensive assessment of the status of the soy bean industry in North America and of its possibilities in Australia. Another crop which may have possibilities in Queensland is rice and, here again, seed of a considerable range of varieties has been obtained from overseas. These are being tested as an essential preliminary to the possible establishment of rice-growing in certain districts in the State.

Fertilizer and Varietal Trials.—As in previous years, the experimental programme on established field crops covered a very wide range of fertilizer and varietal trials. Another important feature of the activities of the field officers was their participation in a seed selection programme covering maize, wheat, grain sorghum, peanuts, and tobacco. This important seed selection work has now been supplemented by a seed certification scheme which already provides for hybrid maize, sorghum, and beans.

Plant Breeding.—Plant-breeding activities in field crops have been maintained more or less on the same basis as in previous years, except for the fact that improved facilities are now available for handling this type of work in the case of wheat, oats, and sorghum at the Hermitage Regional Experiment Station outside Warwick. Attention is directed to an article to appear in the August, 1947, issue of the *Queensland Agricultural Journal* in which departmental progress in wheatbreeding during the 1946-47 season is discussed. The illustrations contained therein may be regarded as striking evidence of the promising nature of the material at present being produced and tested in the case of this valuable field crop.

Storage and Transport Problems.—One of the most important recent developments in the horticultural activities of the Department has been the initiation of extensive work on fruit and vegetable storage and transport problems. Satisfactory progress has been made in this investigational sphere which is of particular importance in a tropical and subtropical State such as Queensland.

Pest Control.—The work of the several sections of the Science Branch also has been attended with a considerable measure of success. Naturally, further possibilities of new insecticides, such as DDT and Gammexane, have been investigated by the entomologists of this branch, as also have new fungicides by the Plant Pathology Section.

Agricultural Chemistry.—The Chemical Laboratory is playing a part of growing importance, particularly in the realm of soils, irrigation waters, and biochemical problems. Land settlement projects for ex-servicemen have placed an increasingly large measure of responsibility on the Plant Nutrition Section of this branch. This responsibility, involving as it does a great deal of soil surveying and analytical work, which has been carried out in co-operation with officers of several branches, has been discharged with a marked degree of efficiency. It can be claimed that every precaution which can be taken by this Department to ensure that new areas made available for settlement have a reasonable prospect of success is being observed. The biochemical work is being steadily developed because of its obvious great importance to the herds and flocks of what is still—and is likely to remain largely—a primary producing State.

Tropical Agriculture.—The main activities of the Bureau of Tropical Agriculture included the establishment of pastures for grazing trials, designing of paddocks and water supplies, and the introduction of grasses and legumes and their further increase for seed supply. In addition, various tropical crops have been grown and the details of their behaviour recorded.

Agricultural Research.—Agricultural research work of the year included winter cereal breeding; cotton breeding and pest control; field trials with potatoes, oats, maize, lucerne, tobacco, sorghum, soy bean, and cow pea; and seed selection—wheat, maize, rice, sorghum, peanut, and tobacco.

Advisory Work.—No reference to the work of the Plant Industry Division would be complete without mention of the very great volume

of advisory work which is handled both by the Head Office staffs and by the staffs of the various branches located at different country centres. These officers whole-hearedly discharge a very worthwhile service to the primary producers in their various districts. The work perfomed by them contributes very largely to the success of the Department and to the esteem in which it is held by the general body of primary producers.

The policy of providing improved accommodation for departmental officers at country centres—which was of necessity suspended during the war years—has been continued during the year under review. The latest improvement is at Toowoomba, where the officers of the Science Branch now occupy commodious and well-equipped laboratories. The field officers of the Division of Plant Industry and other departmental officers stationed at Towoomba have also been supplied with markedly improved office accommodation at that centre.

Field Crop Production.

Sugar.—Final sugar production figures for the 1946 season, as supplied by the Sugar Board, show that 512,086 tons of 94 n.t. sugar were manufactured. This figure is 132,503 tons short of the 1945 production following a prolonged dry period in all sugar districts and serious frosts in the southern and central areas. In only one of the war years was a lower production figure recorded. The quantity of cane harvested was 3,714,475 tons and consequently 7.25 tons of cane were required to make 1 ton of 94 n.t. sugar. This is only the fourth occasion in the past 16 years on which more than 7 tons of cane have been required. The c.c.s. value of the cane was 13.89, an exceptionally low figure and caused largely by continuous dry weather and frost-damaged cane. This low quality is reflected in the tons of cane required to manufacture 1 ton of sugar.

The average price for the 1946 sugar crop was £21 16s. 10d. per ton, an advance of £1 10s. 9d. per ton on 1945 figures (compared with £19 16s. 1d. in 1944). The total value of the crop was, therefore, £12,160,000 compared with £13,000,000 in 1945.

The 1947 crop is estimated to produce 3,900,000 tons of cane, and this should yield 550,000 tons of sugar. This figure, if achieved, will be a distinct advance on 1945 production, but will not be up to 1944 manufacture and will be a long way behind pre-war peak years. Crop estimates are improving as the result of the early spring rains, and it is probable that the estimate of 1947 production is somewhat conservative.

Wheat.—Weather conditions from the time of sowing until mid-September were very dry with a succession of heavy frosts. Practically all the early and mid-season sowings, which constituted most of the area planted, failed for grain and were grazed off.

After the September rains, some sowings were made and despite the lateness of the season yields of up to 18 bushels per acre were obtained. In some circumstances, the behaviour of these late-sown crops

was remarkable as they showed little or no signs of rust and developed good quality grain. The total yield, however, was only about one million bushels, the lowest for 20 years.

As has been the experience for several seasons, varieties bred by the Department of Agriculture were outstanding and filled the first seven places in a census of wheat varieties planted in Queensland this season.

One unnamed crossbred (Three Seas x Florence x Kenya 6041) again demonstrated its resistance to rust and also yield capacity under adverse conditions and may prove to be the best of many excellent varieties bred by the Department.

Maize.—The yield on the whole was not good because of an increased acreage of grain sorghum and also seasonal conditions. In most districts early-sown crops were poor, consequently most of this season's grain will come from the late-sown crops which on the whole were much better.

On the Atherton Tableland an area of approximately 24,000 acres was sown for an estimated yield of between 18,000 and 19,000 tons.

Grain Sorghum.—Both acreage sown and total yield were easily a record. It is anticipated that the yield will be between three and four million bushels of grain. This crop is progressively increasing in popularity, and while this is to some extent the reason for the record acreage sown, the fact that large areas which normally would be under wheat were available for sowing with grain sorghum also was a factor.

Potatoes.—The potato crop in southern districts was the lowest since the contract scheme came into operation in 1942. The spring crop was light because of the dry weather, and it was only in localities where irrigation is practised that satisfactory yields were obtained. The autumn crop was very light because of excessive wet during February and March.

In North Queensland, it has been necessary to reduce the area under potatoes since Defence Force demands ceased. It is hoped, however, that it will be possible to maintain the industry at its present level of sufficiency for the requirements of the population north of the tropic of Capricorn. The crop for the past season in the Burdekin district was satisfactory in both quantity and quality.

Moth attack, which is usually severe towards the end of the season, caused only minor damage. Growers who used the insecticide DDT were highly satisfied with the result. The varieties Bismarck and Brownell were the most widely grown, but Factors also are gaining favour.

Tobacco.—The area under tobacco was greater than that of the previous season. In the Mareeba and Dimbulah districts, the season was not very favourable for non-irrigators. In the dry-farm areas no trouble was experienced in geting good strikes in the field, and although the crops continued to look promising curing difficulties arose because of the seasonal conditions. The rainfall during January was the lowest for over 70 years. February rains were normal, yet insufficient to compensate for the lack of moisture during the previous months. Blue mould did not show up at all during the season and mosaic was less severe than usual.

The total area planted was 1,361 acres—738 acres in the Mareeba district and 623 in the Dimbulah district. It is expected that approximately 950,000 lb. of cured leaf will be appraised for the season.

In the south-western districts the area planted was greater than that of the previous season. Conditions were favourable for the raising of seedlings, and after planting out had been completed large numbers of seedlings were still available. Crops made very good growth. DDT was used extensively in the seed-beds, with the result that seedlings were remarkably free from insect injury. The area planted was 865 acres for an estimated yield of approximately 928,000 lb. of cured leaf.

Peanut.—A record peanut acreage was planted, the area being over 40,000 acres—50 per cent. greater than any previous acreage planted. The estimated yield is 20,000 tons. There was an expansion of the industry not only in the South Burnett but also in the Upper Burnett and on the Atherton Tableland.

Canning Bean.—The area cropped was below that of previous seasons, but yields generally were excellent, and it is anticipated that the yield will be equal to if not greater than that of any previous season. Yields of up to 33 bushels per acre were obtained in the Kingaroy district. The quality was excellent.

Sunflower.—The area under sunflower increased because of a ready market for all seeds with a high oil content. The increase in acreage also has been influenced by the introduction of the short-growing varieties, Mannonite and Sunrise, which can be mechanically harvested. Yields from these varieties, so far, have not been as heavy as those from the tall-growing varieties, but analyses have shown the oil content to be high. The reduced cost of harvesting the dwarf varieties compensates for any reduction in yield.

Soy Bean.—Some fairly large individual areas were sown; results on the whole were sufficiently good to encourage growers to sow again next season. Yields of up to 20 bushels per acre were reported, and considering the season and the lack of experience in mechanically harvesting the crop, were satisfactory. Despite high prices for the beans, it would seem that the bulk of the crop is being retained for seed for the next season's sowing.

Although it has been demonstrated over a number of years that the crop can be grown successfully in many districts, field officers are not recommending production on a large scale until such time as an assured market is available.

Cotton. Weather conditions in the past season were not conducive to successful cotton-growing, and many crops were checked to such an extent that when the abundant February rains occurred they were unable to respond and did not fully recover. The cotton acreage for the 1946-47 season was again small, although the seed applications showed an appreciable increase over the 1945-46 season, being 18,000 acres applied for by 1,085 growers. In many cotton-growing areas sufficient moisture to prepare the seed-beds and to plant cotton was not available until late November and December, which resulted in a reduction of acreage. From past experience, best results are obtained from October plantings.

HORTICULTURE.

Investigational Work.—In the course of the year investigations into problems associated with fruit and vegetable production covered: Refrigerated transport; wastage in pineapples; storage of pineapples for canning and marketing; packing experiments; maturity standards; banana ripening; and oiled fruit wrapping substitutes.

Experiment Stations.—The development of the new fruit and vegetable experiment station near Nambour in the Maroochy district was continued. Investigations included field trials of various leguminous cover crops, soil management, plant breeding, and the harvesting of ginger. Papaw-breeding plots also were established.

At the Kamerunga Experiment Station, near Cairns, North Queensland, appreciable progress was made in soil management investigations. Field work in relation to tropical agriculture was continued.

Land for a new experiment station was purchased in the Redlands district, largely for investigation into the cultural, pest, and disease problems associated with market gardening.

Citrus Fruit Production.—Among important departmental activities is the supplying of pedigreed budwood to nurserymen, among whom nearly 100,000 buds were distributed.

Bananas.—The area under bananas increased slightly to over 13,000 acres. Bunchy top continues as a major problem in the industry and active measures were applied towards its effective eradication.

Deciduous Fruits and Vines.—Further evidence has been forthcoming that, while so-called trace elements are an important influence in the nutrition of deciduous fruit trees in the Stanthorpe district, the basic problem for this area is one of supplying trees with adequate nitrogen at the right time.

An area of suitable land has been acquired in the Granite country for experimental work in viticulture, particularly in respect of the control of phylloxera, phylloxera-resistant stock performance, and of planting distances. Up to the present time the Stanthorpe district has been free from phylloxera and every precaution is being taken to keep it free.

The Stanthorpe district produced a very heavy crop of apples and some 60,000 bushels were exported to Singapore and the Far East.

Quarantine.

New varieties always make an appeal, and with air services now available greater facilities exist for the importation of plant material from overseas. In consequence, there are many progressive orchardists and others seeking permission to import, while others, not realising the risks involved or of the existence of quarantine laws, import material direct. While it is recognised that every opportunity should be taken to improve varieties, it is felt that the harm done by introducing a disease may far outweigh the possible advantages. The position is that quarantine restrictions must be enforced and also that the Department and Plant Introduction Service of the Commonwealth are fully alive to

the advantages and no opportunities are lost to import potentially valuable material and growing it, in the first place, under such conditions as to eliminate risks of disseminating new strains of disease or new diseases.

ANIMAL INDUSTRY.

Pastoral Conditions.

Live Stock Statistics.—The latest available figures show the approximate number of the principal classes of live stock within the State as at 31st March, 1947, to be (figures for the previous year are in parentheses):—Horses, 343,172 (367,357); sheep, 16,084,340 (18,943,762); cattle, 5,945,285 (6,538,067); swine, 340,150 (415,411).

Extension Work and Animal Health.—An extended programme of extension work, including disease and pest control, was carried out during the year.

Sheep and Wool.—Seasonal adversity is reflected in the sheep population which, as estimated, has considerably decreased. Losses in some districts were as high as 25 per cent., while many returns show losses of 10 per cent.

The seasonal conditions also have been reflected in the sheep market. Because of the British agreement, fat lambs have commanded a uniformly high price throughout the year.

The last wool sale in June closed the first year in which wool has been sold by auction since the second world war began. Prices have been at a record high for good quality stylish spinners' wool, free or practically free from vegetable fault, but towards the end of the year a marked price differential was obvious against poor quality faulty wools. American competition has been partly responsible for the stability of the market, and in all 467,772 bales of wool were sold, realising £16½ millions.

The Farmers' Wool Scheme.—The Farmers' Wool Scheme continued to function as usual and 747 bales of wool were handled in the departmental wool room. This shows an increase of 101 bales on last year's total and 267 growers availed themselves of this service. The top price obtained was 46¼d. per lb. for one bale. The market's discrimination against poor quality wool has been reflected in the prices received for the lower lines.

Pigs.

Prices.—The *Pig Meats Acquisition Plan* of the Federal Department of Commerce terminated on 31st December, 1946, so that the price of pigs is no longer controlled. However, the original agreement with Great Britain for pig meats has been varied, whereby quantitative restrictions have been removed and the existing price equivalent to 9d. per lb. for first quality baconer carcases up to 180 dressed weight, at port of export, is to continue to September, 1948. This agreement influences the local price to some extent and tends to give a measure of stability to the industry.

Production.—Production figures for the year reveal a decline as a result of a number of factors, including adverse seasonal conditions, shortage of feeding stuffs, and shortage of building materials.

As a result of these unfavourable conditions, many farmers sold breeding stock for slaughter. With better seasonal conditions and the improved grain position, production is now returning to normal.

Stud Pig Breeding.—The demand for stud pigs was firm throughout the year, not only within this and other States but from New Guinea and other Pacific Islands. Breeders are making every effort to obtain fresh blood lines in order to maintain and improve the quality of their stock. In the selection of breeding stock the services of the Department were made available to buyers and duly appreciated.

Poultry.

Because of a general scarcity of poultry feeding stuffs, egg production declined considerably during the past year. The intake of the South Queensland Egg Board was 8,777,248 dozen, as compared with 11,085,699 dozen in the previous year.

These figures, however, are far short of the State aggregate, as complete production statistics for the Central and Northern Divisions are unavailable.

Slaughter of Poultry.—During the period under review, two large slaughtering works were established. These new establishments are modernly equipped with chilling and cold store rooms. Poultry are slaughtered on these premises for the local and overseas markets. In addition to these establishments, poultry are still being slaughtered on smaller premises which were operating in previous years.

There is evidence of increased slaughterings during the present year, largely because of the shortage of food supplies. Following is a comparison for the years 1945-46 and 1946-47:—

	1945-46	1946-47
July to December	232,765	316,202
January to June	305,773	327,803

Export.—During the year approximately 557 tons of dressed poultry was exported to Great Britain. This is equivalent to about 300,000 fowls.

Table poultry values have been maintained throughout the year at ceiling prices.

DAIRYING.

The 1946-47 season opened unfavourably for the dairy industry. All dairying districts were affected by the dry weather which had continued since the autumn. Fair storm rains occurred in September in parts of the South-east division and were followed by further falls in October, but other districts did not benefit. In districts so favoured, production commenced to rise, but continued dry conditions in other parts of the State necessitated the purchase of relief fodder. Stock losses occurred in some areas.

Good soaking rains fell in November in the Port Curtis district, while scattered storms occurred elsewhere. Although most herds had by this time commenced their new lactation periods, rainfall generally had been insufficient to stimulate production. Summer fodder crops were planted on a smaller acreage than normally, because of the lateness of soaking rains.

Heavy summer rains in January and February assured pasture and crop growth, and consequently a substantial increase in dairy production. Flooding caused crop and stock losses in some areas. Dam and other water supplies were replenished and dairy cattle regained condition. Favourable conditions continued for the rest of the summer but production was much below the peak of other years. Good weather conditions were general in the autumn and to the close of the statistical year. Large acreages of winter fodder crops have been planted, and dairy production should be well maintained in the first quarter of 1947-48.

Dairy Cattle Statistics.

The dairy cattle population of Queensland during recent years is shown in the following table supplied by the Government Statistician:—

—	1943.	1944.	1945.	1946.
Dairy Cows including—				
Heifers over 1 year ..	1,308,780	1,290,398	1,267,829	1,242,071
Calves under 1 year ..	232,276	225,134	210,960	171,318
Bulls 1 year and over ..	32,569	30,522	30,453	29,312
Total dairy stock ...	1,573,625	1,546,054	1,509,242	1,442,701

Imperial Contract and Subsidies.

As from 1st July, 1946, the contract price of butter exported to the United Kingdom was raised to 216s. 10½d. per cwt. The contract between the British and Australian Governments will continue until 30th June, 1948. Negotiations in connection with the renewal of the contract will possibly be opened when the report of the Dairy Industry Costs Committee is received; it is anticipated that the contract will continue until at least 1950.

The present price, including Commonwealth Government subsidy, expected to return to the producer 1s. 7½d. per lb. commercial butter, was to be reviewed after 31st March, 1947, and the Commonwealth Government has quaranteed the industry that the price for the year ending 31st March, 1948, will not fall below the average price which operated in 1945.

A matter of major interest in relation to the review of prices to be paid producers from April, 1947, was the setting up of a joint dairying industry advisory committee consisting of representatives of the Commonwealth Government and dairy organisations. This committee is charged with investigating the costs of production of dairy produce.

The long-term contract for the sale of the exportable surplus of dairy produce has given a measure of marketing stability never previously experienced by the Australian dairy industry. Land values are buoyant—indicative of the faith of dairy farmers in the future prospects of the industry.

During the war years, and since, all butter distributed in England bore no other description than "National Butter." As from 1st October, 1947, wrappers will be marked with the brand of the country of origin in addition to term "National Butter."

Butter Production and Quality.

Production.—Factory-made butter aggregated 74,068,021 lb., which was estimated to be valued at £6,069,327. This was the lowest butter output in Queensland since the 1927-28 season, and was less than half that of the record season of 1938-39, when 154,377,535 lb. were produced. Although the dry season was the main cause of the decline in butter output, in comparison with that of the preceding season, comparisons of butter production for recent years give a false impression of the decline in dairy production. Over a period of years there has been a pronounced diversion of milk to the market milk trade, cheesemaking, and ice-cream trade, all at the expense of butter.

During the war years emphasis was placed on volume of dairy production rather than on maintenance of quality. While the urgent need for increasing production to meet the needs of food-hungry nations continues, it is equally necessary to produce butter of uniformly high grade. The marked downward trend of butter quality in recent years is deplored. Action to arrest this decline is regarded as urgently necessary. The full co-operation of the advisory services of the Division are obviously available, but success can only be achieved by the united action of all sections of the industry.

New Ways of Making Butter.—Much interest is evinced in new processes for making butter which were developed during the war years in several countries, including the Australian "New Way" process. These methods obviate the use of the churn, the age-old means of changing cream into butter. They are better adapted to the handling of milk and fresh or "sweet" cream, rather than self-ripened, or "sour" cream. Because of sparse settlement, road conditions, and climate, "sour" cream is at present received at all Queensland factories. One of the new machines, developed by Dr. Senn of the Dairy Research Institute in Switzerland, does, however, treat sour cream. In order to determine the suitability under Australian conditions of these machines, which are governed by three underlying principles, the Australian Dairy Produce Board has arranged for the purchase of four machines. These machines will be installed in factories in Victoria, New South Wales, and Queensland, and a technical committee has been appointed to supervise the trials. The "Senn" machine will be placed in the Caboolture butter factory in this State.

Butter Improvement Service.—Field officers of the Division co-operated fully in providing the necessary liaison between the laboratory and the factories in respect of our butter improvement service.

Cheese Production and Quality.

Production.—Queensland cheese production was 17,291,768 lb. in comparison with 26,931,781 lb. in 1945-46. The values were £887,919 and £1,365,919, in the respective years. The decline in production was mainly attributable to the adverse season, but the diversion of large quantities of milk from the Toowoomba and Warwick factories for the Brisbane market milk trade was also a contributory factor.

Milk produced for cheese manufacture returned to the producer an average price of 2s. 3d. per pound butterfat, including Commonwealth Government subsidy. There was a slight change-over from cheese to butter manufacture, but the price margin in favour of the cheese factory supplier has ensured the retention of most cheese factory suppliers.

Grading.—Reciprocity between Commonwealth and State in grading of butter and cheese was continued this year. This has resulted in the official grading of a much higher proportion of cheese than could have been done by State officers alone. The total quantity graded was 9,480,521 lb. The grading results were—

	lb.	Per cent.
Choice and first grade	6,844,074	72.9
Second grade	2,453,233	25.88
Third grade	183,214	1.93

These results are almost similar to those of the preceding season, the corresponding figures for which were 1.26 per cent. choice, 69.01 per cent. first, and 28.28 per cent. second. This is an achievement for which the cheese industry is to be commended, for the protracted dry season caused a serious unbalance of milk constituents, especially protein and mineral salts, which in turn caused much difficulty in maintaining cheese quality. Butterfat content of milk received at some factories in the prolonged dry period fell to the low average of 3.3 per cent., casein 2.2 per cent., and cheese yield 9 lb. per 100 lb. milk; the normal figures average fat 4 per cent., casein 2.7 per cent., and yield 10.7 lb. per 100 lb. milk.

Market Milk.

In recent years, there has been a world-wide increase in the consumption of fresh wholemilk, a trend which also is evident in Queensland. Information from the Government Statistician shows that in 1945-46 over 14,000,000 gallons more milk (approximately equivalent to 2,800 tons of butter) was consumed in this way and as ice cream than in 1940-41. In view of this, it is pleasing to note the lively interest of many Queensland dairy associations in the pasteurised milk trade. A keener public appreciation of nutrition and, in this connection, of the pre-eminent place of a safe, high-quality milk supply is evidently mainly the reason for the greater quantity of milk consumed. This trend is a good thing in the interest of public health, the more effective use of the food constituents of milk, and the potentially more stable and higher-price market for dairy farmers.

The quantity of protein in the separated milk fed to pigs in Australia approximates the whole of the protein produced by the Australian beef, mutton, lamb, and pig-meat industries.

The services of field officers have been freely available to dairy companies which have entered the market milk trade in assisting them to obtain clean, high-quality milk. Our laboratories also have given good service to both producers and factories.

The system of quality control in respect of board-controlled milk is operated by the Division of Dairying. It has materially helped in raising the quality of market milk during the period of seven years since its inception. The scheme provides for effective liaison between the milk treatment plants, producers, laboratory, and field staff.

Board-controlled milk has increased from about 10,000 gallons daily in 1938 to 30,000 gallons daily. The proportion sold as bottled pasteurised milk is estimated to have risen from about 6,000 gallons to 20,000 gallons daily. Every effort is being made to ensure a safe, clean, and wholesome milk supply for consumers.

Other Products.

Butter manufacture stands pre-eminent as the major use to which milk is put in Queensland, with the cheese and market milk sections of the industry of relatively lesser importance. Until recent years, there has been little attempt in Queensland to manufacture other milk products or milk by-products.

Buttermilk.—Several factories have installed roller dryers for the drying of buttermilk, which is used in stock-feeding, particularly by poultry farmers. At two factories, a better quality dry buttermilk is produced. This is sold to the confectionery, ice-cream, fruit drink and biscuit trades. The State's output of dry buttermilk of both qualities in 1945-46 was about 500,000 lb.

Concentrated Milk.—In the course of the year a plant was installed at one factory for concentrating milk.

Margarine.—A world-wide shortage of vegetable fats prevented margarine manufacturers from being able to fulfil the quotas of table margarine allocated them under *The Margarine Act Amendment Act of* 1939.

Dairy Research.—Officers of the dairy research laboratories at Brisbane, Hamilton and Toowoomba investigated many problems of the dairy industry in the course of the year. Research projects included: Manufacture of a non-fat-leaking cheddar cheese; control of mites in cheese factories and cold stores; control of bacteriophage in cheese factories; variations in the composition of milk throughout the year; control of milk quality for the Brisbane Milk Board; improvement in butter composition and quality; and chemical engineering investigations.

Herd Recording and Improvement.—The average production of purebred cows which completed a lactation period of 273 days was 658 gallons of milk and 326 lb. of butterfat. The average butterfat test was 4.84 per cent.

Grade Herd Recording.—For many years the Department has operated a scheme of herd testing, whereby farmers weighed and sampled the milk of the cows in their herds once every two months and forwarded the sample to a factory or the Herd Testing Section in Brisbane. Butterfat tests were made and all records were compiled in Brisbane and sent to the farmer. This scheme is entirely free of cost to the co-operating farmer.

An improved system of herd recording and its early establishment are now under consideration. This new system provides for the formation of herd recording units of about 25 farmers, milking an aggregate of 800 cows; and for the monthly testing of each herd by a recorder who will visit farms, weigh and test the milk and make the necessary calculations. Many dairy farmers have already signified their desire to co-operate with the Department in the establishment of this projected new service.

MARKETING.

A daily market reporting service was instituted in the course of the year. Through this service, farmers and others interested are kept fully informed by Press reports and radio broadcasts on current market conditions, prices and prospects. A monthly production trend and crop reporting service also was inaugurated.

An amendment of *The Primary Producers' Organisation and Marketing Acts* was enacted in the course of the year for the purposes of clarifying the authority of the Northern Pig Marketing Board to control the selling of carcases as well as live pigs within its area; including the word "marketing" in the designation of commodity boards with marketing powers; and giving power to commodity boards to establish superannuation schemes for the benefit of employees and their dependants.

Two new marketing boards were set up—the Navy Bean Marketing Board and the Central Queensland Egg Marketing Board.

Early this year a wheat production costs committee was appointed by the Commonwealth Government. Evidence prepared for submission to this committee in the course of its inquiry outlined the peculiarities of wheat growing in Queensland, with particular reference to production costs in this State.

The year's operations of the commodity boards constituted by statutory authority are reviewed fully in the Report of the Director of the Division of Marketing.

PUBLICATIONS.

An extensive departmental information service was maintained during the year. The chief channels of communication were *The Queensland Agricultural Journal, The Queensland Journal of Agricultural Science, The Cane Growers' Quarterly Bulletin*, bulletins and advisory leaflets, and the public press and radio services.

HYDATIDS IN ANIMALS AND MAN.

Hydatids is primarily a parasitic disease of domestic animals, but man also may be affected. To understand this disease a knowledge of the life history is essential.

The hydatid tapeworm inhabits the small intestine of the dog and of wild carnivorous animals. It is extremely small contrasted with the tapeworms of other species seen in the same host. Ripe segments full of eggs are passed by the host animal and are eaten by the intermediate host, usually a sheep, pig or bovine. The eggs hatch into minute embryos, which burrow through the intestinal wall into the blood stream and are carried to various organs, usually the liver or the lungs. In these sites they give rise to large white-walled cysts which are frequently observed after slaughtering. Only occasionally do these cysts give rise to symptoms. Should humans become infected, however, the condition becomes far more serious.

The life cycle is completed when dogs eat the affected organs of the intermediate hosts. Each cyst may give rise to a large number of tapeworms.

Control measures advocated are:—

(1) Boil all offal, especially from sheep, before it is fed to dogs.

(2) Wash the hands, especially before eating or smoking, after dogs have been handled.

(3) Prevent children from playing on the ground in the vicinity of dog kennels. The soil in these locations may be contaminated with tapeworm eggs.

(4) Dose dogs regularly with arecoline to control tapeworms.

The Beef Industry in the U.S.A.

THOS. G. HOPE.

Mr. Hope, Under Secretary, Premier and Chief Secretary's Department, who is Consumers' Representative on the Queensland Meat Industry Board, was the leader of the Meat Board Delegation to the United States of America in 1945 which investigated latest meat processing practices in that country, as well as the transport of perishable products by rail, road and air.

The subjoined article is based on notes of an address delivered by Mr. Hope at the recent Graziers' Convention at Eidsvold, Queensland. The chief emphasis of his address was on the substantial contribution which the production of beef cattle on small farms, on the Darling Downs and in the Burnett District and other suitable agricultural areas might make towards the supply position in Queensland, particularly if these animals were crop-fattened and sold in prime condition at a time when the ordinary seasonal marketings of fat stock have been completed.

Mr. Hope's remarks are particularly pertinent at the present time, in view of the impending visit to Australia next year of the British Food Delegation, which is to investigate, amongst other things, the possibilities of additional beef supplies becoming available for the United Kingdom market.— Editor.

SOME comparisons between the United States of America and Australia show that each country has approximately the same area—3,027,000 square miles in the United States, as against 2,975,000 square miles in Australia. East to west, the United States extends 2,800 miles; in Australia the distance from east to west is 2,500 miles. Respective distances north to south are: United States, 1,600 miles; Australia 2,000 miles (from Cape York to Wilson's Promontory). A thousand miles inland the United States has the Corn-Belt region, as compared with Australia's artesian basin. The United States has 360 million acres under crop, as against 25 million in Australia. In good rainfall zones, the United States have from 500 to 600 million acres of arable land, or about 30 per cent. of that country's total area; while Australia has 85 million acres within the area of comparable conditions, or 4½ per cent. of its total area.

The average production of grain crops in the United States for the five-year period, 1941-45, and in Australia for the period 1941-42 to 1945-46, is tablulated as follows:—

	Wheat.	Oats.	Barley.	Maize.
	Millions of bushels.			
United States	991	1,274	332	3,013
Australia	125.5	19.3	10.0	6.8

Comparative livestock figures are: United States—beef cattle, 82 million; milking cows, 28 million; 50 to 55 million sheep; and pigs, 50 to 55 million. Australia—beef cattle (as at 31st March, 1946) 11 million (of which half are in Queensland); dairy cattle, 3,200,000 (of which one-third are in Queensland; sheep, approximately 123 million; and pigs, less than 2 million.

Meat Production a Major Industry.

Half of the farm lands of the United States and a considerable proportion of its food processors and distributors are wholly or partly engaged in supplying the country's meat. The Department of Agriculture estimated that 28 cents of the farmers' dollar incomes in the year 1944 was derived from meat animals, compared with 14 cents from dairy products and 11 cents from poultry output.

The wholesale meat-packing industry was third in value of the chief manufacturing industries of the United States for the year 1939, being the leading industry in ten States, second largest in six and third, fourth or fifth most important in 11 States of the Union. More than 1,000 meat-packing companies were operating more than 1,500 plants.

Territory west of the Mississippi produces 62 per cent. of the meat supply, while the population east of that great river consumes 66 per cent. of the total meat production.

Transportation is an important factor in American meat industry. It is estimated that on an average the cattleman trucks his animals nearly 700 miles, while the packer ships the carcasses an additional average of 400 to 500 miles.

The Cattle Country.

In Australia, beef cattle are grown and fattened almost exclusively on natural grasses. Breeding and fattening are often carried out on the same properties; single properties often cover many hundreds of square miles; and many of the larger properties are often unfenced or only partially fenced, with watering facilities primitive and inadequate. Happily, such conditions do not prevail in the Burnett and contiguous districts, as the land is too valauble and expenses of production too heavy to permit of haphazard methods.

In the United States, although cattle are produced more or less extensively throughout the entire country, the main beef cattle regions are the Western Range and the Corn Belt. The Western Range includes, broadly, the States of Montana, Wyoming, Colorado, New Mexico and States further west, together with Texas, Oklahoma and the western portions of Kansas, Nebraska and the Dakotas.

The Corn Belt includes, primarily, Iowa, Illinois, Indiana, Missouri, Western Ohio, and the eastern portions of Kansas and Nebraska.

Classified according to the conditions of production, the country may be said to be divided into four regions. The two main regions are, as stated, the Western Range and the Corn Belt, the third being the Great Lakes Region, which includes the Middle and Northern Atlantic States, New England, Michigan, Wisconsin and most of Minnesota; the fourth area is the Cotton Belt, comprising the States producing cotton, and the sub-tropical Gulf country to the south.

The Western Range is in the main semi-arid, and is devoted primarily to breeding and grazing. The Corn Belt States, besides raising animals on a large scale, engage extensively in fattening cattle brought from the Western Range. In the Great Lakes Region "dual-purpose" herds predominate, and the cattle produced are mostly grass-fed.

It will thus be seen that in the United States the breeding and the fattening of beef cattle are practised as two distinct undertakings.

Whereas "corn-fattening" of cattle in America is a highly organized and extensive business, it is not practised at all in this country and even crop-fattening is practised only to a very limited degree.

Cattle Marketing.

As to cattle marketing in the United States, the first thing observed was that it was carried on largely through a system of centralized marketing points, where also are located extensive slaughtering and packing facilities. There are some 67 well-established markets and it was found that up to three-quarters of all the cattle marketed in the United States pass through these central points. In the Corn Belt the proportion is as high as 85 per cent. There are naturally more markets and slaughtering and packing facilities in the Corn Belt than in the other regions, as the cattle population and production of meat is greatly in excess of purely local requirements. The excess production is transported over long distances by motor trucks or refrigerator rail cars to branch houses for distribution to other points of consumption. This is a phase of the meat industry non-existent in Queensland.

Although the United States was at one time a large beef exporting country that position has now changed. About 35 years ago the decline in beef exports became very rapid, so much so that some five years later beef imports exceeded beef exports. During the decade prior to World War I., the status of the United States shifted from that of a beef surplus to that of a beef deficit country.

The great falling away of the exportable surplus was due, not merely to the fact that production did not keep pace with the growth of population, but to its failure to increase at all; in fact, production declined. This decline was so marked that it greatly affected consumption, which likewise declined. This decline in consumption was not only a per capita one, but was actually an absolute one despite the growth of population.

If such a state of affairs developed in this country, it would, without doubt, have the same result, and soaring beef prices would considerably disturb living costs.

It is, therefore, hoped that ways and means will be found to increase our beef-cattle herds, as the population of Australia is bound to increase. Science and energy is all that is required to accomplish this.

Seasonal Supply of Livestock.

Practices which have been developed in the industry in the United States for many years have resulted in the smoothing out of seasonal flows of livstock to the markets from various parts of the country. For example, cattle from the feed-lots are generally marketed in the months January to June. In July and August, cattle which have been grass-fattened begin to come in from the south-west or from the Kansas and Oklahoma pastures, followed by the range cattle of the north-west, which continues until about the end of November. During this time there also come into the market cows which will not prove profitable to carry through the winter, steers which have been fattened on pasture in the Corn Belt and short-fed animals which have merely been freshened

up in the feed-lots by speculators, and the general "clean-up" of herds that will not winter profitably. December is the month for the marketing of show beef. The shows terminate in the National Livestock Exhibition at Chicago.

Small Marketings by Individual Farmers.

A study of "Marketing Livestock in the Corn Belt Region" by the Corn Belt Livestock Marketing Research Committee, published in 1942, emphasises the influence of small marketings by the individual farmers in the over-all production of the American livestock country. This study covered the 12 North Central States—Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, North Dakota, and Wisconsin, together with Kentucky and Nebraska. These States supplied 87 per cent. of the pigs, 63 per cent. of the cattle, 52 per cent. of the calves, and 40 per cent. of the sheep and lambs sold from farms in the United States in 1940. Farmers in these States who marketed livestock in 1940 sold on an average 15 cattle, 6 calves, 45 hogs, and 54 sheep and lambs per farm.

The average weight of the fed cattle sold in the region was 937 lb., ranging from 679 lb. in Oklahoma to 1,016 lb. in Illinois, and 1,048 lb. in Iowa. They are generally marketed at heaviest weights in States in which the supply of corn is large and cattle feeding is important.

The average annual maize yield in the United States is well over 3,000 million bushels. Well over ninety per cent. of that yield is retained on the farm for feeding to stock. In addition, there are considerable quantities of other grains, such as grain sorghum and barley, which are also produced on the farm and used almost entirely for stock feeding.

Mr. C. J. McKeon, Queensland Director of Agriculture, who recently visited the United States, has given me an example of the extent to which hand feeding of beef cattle is practised in that country. Mr. McKeon found on a visit to a large property in California that 2,300 head had been fattened on that particular country and sold during the first nine months of last year (1946). Several hundreds more were in the yards in various stages of preparation. Previously the owner had been raising and fattening his own cattle, but latterly had entered into contract with a big rancher to fatten stock under contract. On this property it was the intention to turn out at least 3,000 head for the year 1946. These cattle were all well-bred Herefords and would average 18 to 20 months in age at the time they were brought into the yards. They were intensively hand-fed for a period of about three months before being marketed at 900 lb. to 1,100 lb. live weight. With the exception of concentrates, the whole of the feed requirements was produced on the property on which the cattle were being fattened.

From his observations whilst in the United States, Mr. McKeon found that a large proportion of choice hand-fed cattle marketed in the States comes from small farms on which only a small number are fattened at a time.

Possibilities of Crop-fattening in Queensland.

It would seem, therefore, that substantial benefits to the livestock industry in Queensland might well follow the adaption of the pattern which has been pursued with much success in the United States. Agricultural areas in this State might be suitable, perhaps, to this diversified form of farming, and the examination of the possibilities by those concerned, including producers' organizations, is suggested. It is felt that everything possible should be done to enlarge the period of slaughtering operations in this State by spreading the marketing of prime beasts over a longer period than now prevails. Professor G. W. McCampbell, of the Kansas State College of Agriculture, has stated that more than two-thirds of America's farm and pasture areas produce crops that must seek their final market in the form of meat, dairy, or poultry products, unless fed to other farm livestock.

Certain of our agricultural areas on the Darling Downs and in the Burnett might well be adapted to the practice which has been followed so successfully in the United States and enable livestock to be marketed in prime condition when the usual seasonal flow is diminishing. This envisages the adoption of a policy of utilizing grasslands in rotation with cultivated crops, such as grain sorghums and lucerne. In the Burnett, I am told that the reversion of lands to grass pastures in rotation would be beneficial to the soil itself in restoring organic substances. Such a system of livestock production would ultimately make a substantial contribution towards the increased livestock requirements of this country, while also being of benefit to the producers engaged in the industry.

GRAIN SORGHUM FOR STOCK.

Grain sorghum is a foodstuff of which many stockowners have had little experience. To such stockowners the following information on how to feed grain sorghum to farm animals will be helpful.

The grain is very similar in composition and food value to wheat and maize. It should be coarsely crushed or rolled for feeding to cattle and horses, and comparatively large quantities may be fed to cattle without producing digestive troubles. However, as it is a relatively heavy feed, it is best fed with some bulky feed such as chaff or silage or a bulky concentrate such as crushed oats or bran.

As with the other grains, sorghum has only a comparatively low protein content, and so must be supplemented with protein-rich feed such as lucerne or clover hay, or with protein concentrates such as linseed meal or peanut meal. It may be substituted pound-for pound for crushed wheat, crushed maize or crushed barley, and about four parts crushed grain sorghum may be regarded as equal to about five parts of crushed oats.

There is no necessity to crush the grain for pigs when it is given through self feeders, but if hand-fed to pigs is should be coarsely crushed or otherwise its digestibility will be considerably impaired. Sheep masticate all whole grain very thoroughly and there is no need to crush the grain for this stock.

Whole grain may be included in the grain ration for poultry, and crushed grain may be used as a considerable proportion of the mash.

Harvesting, Handling, and Packing of Pineapples.

C. G. WILLIAMS, Supervisor, Preparation and Transport, Horticulture Branch.

THE pineapple is very susceptible to bruising; consequently, the harvesting, handling, packing and transport of the fruit must be conducted in a manner designed to prevent such injury.

Bruised areas on the fruit permit the entry of rot-producing organisms which will rapidly render the fruit unfit for consumption. Superficial bruises are not easy to detect when the fruit is being packed and then, often, only by the slight exudation of juice at the location of the injury.

Extra time spent in careful preparatory operations, and the liberal use of wood wool in packing, will pay good dividends, especially on distant markets where wastage is likely to be higher than on local markets.

In order to market fruit in a sound and attractive condition, the following procedure is suggested in regard to the selection of the fruit and handling and packing methods.

A. Type of Fruit.

None of the following types of fruit should be included:—

(*a*) Fruit visibly affected with sunburn, frost injury, yeasty rot, black speck or bruises.

(*b*) Fruit showing any leakage of juice at packing (except at cut stalk) whether from bruises, growth cracks or other causes.

(*c*) Fruit with more than two tops.

(*d*) Fruit with knobs or slips on base of fruit.

(*e*) Fruit with aborted, dwarfed or deformed tops.

(*f*) Malformed or crippled fruit.

(*g*) Fruit whose stalks have been wholly or partly broken before maturity. (Such fruit is invariably of poor quality and subject to black heart.)

B. Maturity.

(*a*) All fruit should conform to current Departmental standards of maturity and all fruit in the one case should be uniform in colour.

(*b*) Fruit packed for distant markets, such as Adelaide, New Zealand, &c., must not show more or less than a tinge of yellow colour.

C. Handling.

(*a*) Fruit should be cut from the plant and not snapped. If necessary, the stalk should be trimmed back by a second cut to project ¼-inch beyond any part of the base of the fruit.

(*b*) Fruit should be carried out of the plantation to the end of the rows in the arms or in baskets, *not in bags.* Baskets should be free of internal projections and may be padded with wood wool.

(*c*) Whatever type of container or transport vehicle may be used for the conveyance of the fruit from the plantation to the packing shed, the fruit should not be placed in a high stack, as this is conducive to bruising.

(*d*) Wood wool padding should be used between the fruits as much as possible during all handling operations.

D. Packing Shed.

(*a*) Any discarded fruit, tops, leaves or other refuse accumulating during packing should be removed *completely* within twenty-four hours. Such refuse should preferably be buried, or, failing this, removed at least two hundred yards from the packing shed and there spread out rather than heaped up.

(*b*) The packing shed, floor and packing bench, together with picking baskets, field crates (where re-used) and transport vehicles, should be disinfected once a week by spraying with 2½ per cent. formalin (2 fluid oz. per gallon). This can be done with a knapsack spray or stirrup pump.

(*c*) Packing sheds should preferably have wood or concrete floors, *not dirt floors.* The best type is a hardwood floor raised to truck height. (Recommendations and designs for packing sheds can be obtained from this Department.)

Both shed and equipment should be designed to allow easy cleaning of the entire shed.

E. Packing.

(*a*) All fruit should be packed in clean cases. The tropical case, 24½ inches long, 12 inches deep, by 12 inches wide, is used for packing pineapples.

(*b*) Cases should be made up with end cleats parallel to the sides of the case, so as to assist carriers to stack them in their correct position—on their sides. Cases should be as strongly made as possible, preferably with 1¾-inch nails

(*c*) Fruit in the one case should be uniform in size. Over-size tops may be trimmed back, but not to less than two inches from the solid core of the top.

(*d*) Fruit should be firmly packed with not less than 60 lb. of fruit in the case. Wood wool should be used at each contact of fruit with fruit or fruit with case.

(*e*) Packed cases, after the lid has been nailed down, should have a bulge of half-an-inch at the top centre and bottom centre of the case.

(*f*) The case should be clearly branded on *both* ends with—

(1) Grower's name and address.

(2) The name of the fruit.

(3) Count and variety (*smooth* or *rough leaf*).

(4) Consignee's brand.

Packing Procedure.

Before proceeding with packing, the pineapples should be graded for colour and size.

Colour should vary from a tinge of yellow for distant export markets to three-quarters yellow colour for the local trade and it is desirable that the cases should contain fruit of uniform colour. On no account should green immature fruit be packed. Pineapples will not develop sugar after picking; therefore, fruit picked before it has developed any yellow colour will not improve much in flavour and will remain acidic and unpalatable, even though it will eventually turn yellow in colour.

Grading of the pineapples may be done either in the field from the harvesting baskets into lug boxes or other suitable containers placed at the end of the plantation rows, from the transport vehicle at the packing shed direct to packing benches, or from the transport vehicle at the packing shed into boxes. The placing of ungraded or graded fruit into large heaps is not recommended, as this is conducive to bruising.

A suitable grading board may be made by cutting holes of the required diameter out of three-ply or pine board.

Packing. The packing of pineapples is, comparatively speaking, a simple matter. Varying shapes will occur in any particular variety, but, provided proper grading methods are used, no difficulty should be experienced in packing fruit of irregular shape.

By reference to the illustrations (Plates 1—9) the method of placing and packing the various sizes can be easily understood.

Large pineapples do not carry well. Therefore, fruit larger than 11 count (5 inches diameter) should be forwarded to the factory.

Pineapples smaller than 27 count (3¼ inches diameter) should be disposed of at local markets.

Plate 132.
11 Pack—Bottom Layer.

Plate 133.
11 Pack—First and Second Layers, 4 x 3.

Plate 134.
11 Pack—Top View of Finished Case. Three Rows, 4 x 3 x 4.

Plate 135.
14 PACK—BOTTOM LAYER.

Plate 136.
14 PACK, SHOWING POSITION OF LAYERS. THREE LAYERS, 5 x 4 x 5.

Plate 137.
14 PACK—TOP VIEW OF FINISHED CASE.

Plate 138.
21 Pack—Bottom Layer.

Plate 139.
21 Pack, showing Position of Layers. Three Rows, 7 x 7 x 7.

Plate 140.
21 Pack—Top View of Finished Case.

For general purposes, the following table of packing counts will be found satisfactory:

PINEAPPLES PACKED IN THE TROPICAL FRUIT CASE.

24¾ inches long, 12 inches deep, 12 inches wide.

Plate No.	No. of Fruit in Case.	Diameter of Fruit at its Centre.	No. of Layers in Case.	No. of Fruit in Each Layer.	Method of Placing the Layers.
1, 2, 3 ..	11	5 inches	3	4×3×4	Single row in line; each row placed alternately with the stalk ends of the fruit touching opposite side of the case.
	12	4¾ inches	3	4×4×4	Ditto
4, 5, 6 ..	14	4½ inches	3	5×4×5	Ditto
	15	4¼ inches	3	5×5×5	Ditto, OR, with the end pineapple in each row reversed so that its stalk end touches the opposite side of the case.
	18	4 inches	3	6×6×6	Two rows are placed so that each fruit has its stalk end alternately at opposite sides of the case.
7, 8, 9 ..	21	3¾ inches	3	7×7×7	Ditto
	24	3½ inches	3	8×8×8	Ditto
	27	3¼ inches	3	9×9×9	Ditto

Factory Pineapples.

The Committee of Direction of Fruit Marketing, Brisbane, has supplied the following information with regard to factory pineapples:—

"Cannery pineapples will be received by the C.O.D. for distribution to factories subject to the following conditions:—

1. At loading centres where C.O.D. loaders are employed, pineapples will be accepted only through the C.O.D. loader.
2. All fruit to be freshly picked and to be loaded in a sound condition.
3. Smooth Leaf variety only to be forwarded.
4. *Colour Standard.*—Fruit shall be picked when showing the following colour:—

   Grade 1—Half-coloured.

   Grade 2—Quarter-coloured.

   'Smalls'—Half-coloured.

   The colour standard may be varied from time to time by notification through the 'Fruitgrowers' Gazette,' except that at all times 'Smalls' must be at least half-coloured.

TWO METHODS FOR PACKING FACTORY PINEAPPLES. NOTE THAT TOPS ARE REMOVED (CUT) AND WOODWOOL PADDING IS NOT REQUIRED IN FACTORY PACKS.

Plate 141.
1 Row Vertical, 2 Rows Flat. Total, 15 Pineapples.

Plate 142.
2 Layers Flat—16 Pineapples.
The average net weight for factory fruit should be 64 lb. per case.

"With the object of easing factory deliveries as much as possible during the peak weeks, the factories have agreed to a relaxing of the external colour standard. It is suggested to growers that pineapples should be forwarded during the weeks just prior to the peak of the crop if they consider that the internal colour indicates that the pineapple is suitable for canning.

"Many growers know from experience that pineapples under certain conditions, although only showing the first tinge of colour at the base, have the internal yellow colour required for canning.

"Growers are asked to exercise care in excluding fruit which will be too green for canning and which would have to be rejected at the cannery.

"It should be clearly understood that growers must accept full responsibility for the fruit being ripe enough for canning. When supplies become heavy, the external colour standard as shown above must be strictly observed.

"By the adoption of the above suggestion, it should be possible for factories to handle thousands of cases more before the peak of the season than would otherwise be the case if general observance of the colour standard were adhered to throughout the season.

5. Pineapples are to be graded to three sizes as follows:—

(*a*) 4 inches in diameter and under 5 inches to be known as Grade (1).

(*b*) 5 inches and over in diameter to be known as Grade (2).

(*c*) All pineapples not large enough for grade 'ones' to be known as 'Smalls.'

"During the peak weeks it may be necessary to restrict the intake of 'Smalls' and the following specifications will apply:—

'Small' must be not less than 3½ inches diameter and 4 inches in length.

Length.—The full length of fruit in Grades (1) and (2) must be not less than 5 inches, measurement to be vertical, not on curve of fruit.

Minimum Size—Grade (1).—The minimum size pineapple acceptable as Grade (1) must have a full length of 5 inches and have a vertical measurement of not less than 4 inches from where a 4-inch grading ring rests on the shoulders to the base of the pineapple.

6. Grade (2) must be marked plainly in chalk with the numeral '2' on both ends of the cases. It is not necessary to mark Grade (1).

7. 'Smalls' must be marked with a large letter 'S' in white chalk on both ends of cases.

8. Abnormally shaped fruit and large fruit affected with sunburn will be accepted as 'Smalls' for juice purposes. 'Smalls' affected with sunburn are not acceptable.

9. Pineapples should be forwarded *without tops* in all loadings and packed according to Plates 10 and 11. Tops must on no account be screwed off. Projecting stems and fringe leaves at base and top of pineapple must be trimmed off flush with fruit.

10. *Cases—Tare.*—All cases must be weighed and the tare to the nearest pound plainly stencilled on the top board on each side of the case. Number stencils for this purpose will be supplied, free of charge, to those growers who have not already received one, on application to the loader, or where no loader is employed, to the C.O.D.

11. *Branding.*—All cases to be branded distinctly, on each side of the case underneath the tare, with the name of the grower and the railway station from which the fruit is consigned.

12. *Packing.*—Cannery pineapples are carried by the railway on a case rate basis and it is, therefore, necessary that cases be packed to capacity. Care must be exercised, however, to ensure that no fruit projects above the top of the case.

"Growers consistently loading lightweight cases will be debited with the excess freight involved. Cases containing less than a net weight of 60 pounds will be considered lightweight cases.

"Cases containing 'topped' fruit must be loaded without being lidded and with the mouth of the case upwards.

13. These conditions may be varied from time to time."

The Growing of Green Manure Crops in the Orchards of the Stanthorpe District.

A. A. ROSS, Horticulturist.

THE granitic soils of the Stanthorpe district, even when newly cleared, have a low organic matter content, and in order to ensure reasonable cropping capacity in orchard trees it has been found necessary to supply this material regularly to the soil. Since bulky waste organic materials, such as farmyard manure and straw, are not available in large quantities in the district the only practicable method of maintaining a plentiful supply of organic matter is, whenever possible, to grow green manure crops and turn them in.

CROPS TO GROW FOR GREEN MANURE.

It has been found that the majority of the soils in the Stanthorpe district are deficient in nitrogen as well as in organic matter. Thus it is obvious that a leguminous crop should be grown wherever possible, because legumes have the power of utilizing the nitrogen of the air for their own nutritional needs and this, after the green crop has been turned in and has rotted down, becomes available for the use of succeeding crops. Since practically none of the orchards are irrigated, a summer-growing green manure crop cannot be grown successfully between the trees. Such a crop would remove so much water from the soil as to produce a serious moisture deficiency in the root zone of the trees. This means that a winter-growing species must be selected, because during the winter months the trees are bare of leaves and their water requirements are then very low. The climate of the Stanthorpe district places a further severe restriction on the choice of a crop, since the extreme winter temperatures experienced prohibit the growing of many species found suitable for green-manuring purposes in other parts of Queensland.

A number of winter-growing crops have been tested experimentally under Stanthorpe conditions. Of the legume group, New Zealand blue lupins have proved to be the most satisfactory. Among the non-legumes, the cereal group contains several successful winter-growing species and of these Black Winter rye has proved the most reliable. Wheat, oats and barley also produce satisfactory crops when seasonal conditions are favourable. The following notes briefly describe the behaviour of a number of green crop species under Stanthorpe conditions.

New Zealand Blue Lupins.

Lupins have consistently produced a greater bulk of green material than other legumes grown in the Stanthorpe district. After they become reasonably well established they resist drought and frost to a remarkable degree, though they do not make very much headway during the winter months. In orchards, the greater part of their growth should be produced in the autumn; hence time of planting becomes an all-important factor.

Golden Tares.

Stanthorpe climate and soils are suitable for the growth of this crop. However, it does not produce as large a quantity of green

material as lupins; it is more susceptible to frost and is slower growing. Since they have a scrambling habit of growth, tares do well in combination with an upright-growing crop such as a cereal.

Field Peas.

Field peas give a poor yield of green material in comparison with lupins. In addition, because they are very soft and succulent, their contribution of humus-building material is small. They resist moderate frosts but may be damaged or even killed by severe ones. As green manure crops there is little to choose between the available varieties of field peas.

Tick Beans.

Tick or horse beans have not met with much success when grown over a number of seasons. They produce little winter growth and do not thrive under dry conditions. In addition, they are very susceptible to a bacterial disease which gives a very serious setback to the crop.

Vetches.

Only a comparatively light yield of vetches can be expected even in a mild moist winter. They are very susceptible to drought and therefore cannot be relied upon to produce a satisfactory crop every season.

Clovers.

All small-seeded species experience great difficulty in germinating in Stanthorpe soils. Unless soil moisture conditions are just right, small seed such as clover seed fails to germinate freely. If seed is sown shallow, it will frequently lie in a layer of soil which is too dry; if sown at a depth where the soil is moist a large proportion will rot. Clovers, moreover, usually give only a comparatively light yield and do not justify the extra attention necessary to ensure their successful establishment.

Black Winter Rye.

This is by far the most successful of the cereal crops. It has the greatest cropping capacity of them all, is highly resistant to drought and frost and produces a reasonable crop even on poor sandy soils. However, it is relatively slow in decomposing on being turned in and may interfere with the process of nitrification in the soil for an unduly long time, especially when the spring months are dry.

Wheat.

In some seasons, good crops of wheat can be produced but care should be taken to sow a reliable variety of hay wheat. Wheat which is sold as stock feed cannot be considered suitable for seed for a green manure crop; further, many of the varieties grown for grain are unsuitable. Currawa, Ford and Florence are varieties which may be expected to produce reasonable crops. Wheat makes most of its growth in spring, and unless there is sufficient rain at that time the crop will suffer. In many cases, too, it will need to be turned in before it has had an opportunity to produce a satisfactory bulk of material, in order to avoid competition with the trees for the available moisture.

Barley.

Barley is not favoured as a green manure crop in the Stanthorpe district as it is usually not as vigorous as the other cereals. It suffers severely from rust and is susceptible to injury by frost. However, in certain mild winters quite satisfactory crops of Cape or Skinless barley can be produced.

Oats.

Although oats are usually more vigorous than barley, this crop does not tolerate excessively low temperatures. The average winter of Stanthorpe proves too severe for the successful raising of oats and therefore they are not recommended as a green manure.

Plate 143.

Comparison of New Zealand Blue Lupins and Wheat Planted at the Same Time and Grown under Identical Conditions.

PLANTING THE CROP.

Time of Planting.

The time of planting is possibly the most important factor in the production of a green manure crop in the Stanthorpe district. Since irrigation is not practised at all in the orchards the best use must be made of the rain which falls. The average trend of rainfall is light falls in January followed by fairly regular rain in February and March. After the end of March falls become lighter and winter rain is normally comparatively sparse. In order to secure a good germination followed by vigorous growth the following procedure is recommended. The fertilizer should be applied and the soil suitably prepared to receive the seed by the middle of January. Seed should then be sown following the first effective fall of rain. A prompt and efficient germination will result and the normal February rains will ensure desirable conditions for subsequent growth. When this course is adopted, plants become firmly established and sufficiently vigorous by the onset of winter to withstand the cold conditions and a certain degree of drought.

Plate 144.
A Crop of New Zealand Blue Lupins planted in January, 1947.

Plate 145.
A Crop of New Zealand Blue Lupins planted in April, 1947. (Compare with Plate 144.)

Fertilizing.

Fertilizer is best applied at the time of preparing the soil for planting and may be broadcast on top of the weeds and other rubbish just before ploughing or discing. Mixing of fertilizer with the seed has an adverse effect on germination and will kill many of the nitrogen-fixing bacteria on inoculated legume seed. Experiments conducted on the fertilizer requirements of green manure crops in the district have shown that leguminous crops do best when grown on a mixture with moderate nitrogen, high phosphate, and low potash contents. A mixture with a formula of approximately 4:15:2 would be satisfactory. The quantity to be applied per acre will vary with the fertility of the soil at the time of planting, but on an average 2½ cwt. per acre of such a mixture will suffice. Cereal crops have been found to respond only to nitrogen and therefore phosphate and potash can be safely eliminated from the fertilizers used for growing them. A satisfactory dressing for these crops is sulphate of ammonia at the rate of 1½ cwt. per acre or nitrate of soda at the rate of 1¾ cwt. per acre.

Seed Inoculation.

In soils which have never grown a particular leguminous crop successfully it is a wise precaution to inoculate the seed to ensure that the correct strain of nitrogen-fixing bacteria is present. This can be done by coating the seed with a suspension of the specific bacteria. The correct culture can be obtained from the Under Secretary, Department of Agriculture and Stock, Brisbane. It is supplied, with full directions for use, in bottles sufficient to treat either one or three bushels of seed, at the nominal charge of 1s. per bottle. Fourteen days' notice is required when ordering cultures, which may be expected to keep for six weeks if unopened.

Rates of Sowing.

The following rates of sowing have been found satisfactory for most purposes.

Crop.	Rate per Acre.	Crop.	Rate per Acre.
N.Z. Blue Lupins ..	1 bushel	Black Winter Rye ..	1 bushel
Golden Tares	¾ bushel	Wheat	1 bushel
Field Peas	1 bushel	Barley	1 bushel
Tick Beans	1 bushel	Oats	1 bushel
Vetches	20 lb.		

The rate for lupins may be reduced to ¾ bushel after one reasonable crop has been produced on a particular area of land.

Method of Sowing.

A seed drill is the ideal implement for sowing but few orchardists are likely to possess this machine. Broadcasting has to be resorted to in most cases, followed by an implement which will cover the seed. In covering, the object is to place the seed in a layer of soil moist enough to induce germination without burying it too deeply. The larger seeds such as those of lupins should be covered to a depth of about 2 inches and smaller seeds slightly shallower. Tandem disc harrows and rotary hoes are very suitable implements and others such as tine

cultivators and diamond harrows will do the job, though less effectively. When inoculated seed is sown, covering should very closely follow broadcasting, as the drying action of the sun is detrimental to the bacteria on the seed coat. The best results from the use of inoculated seed can be expected only if seed-bed moisture is good, since dry soil, too, can have a very adverse effect on the bacteria.

TURNING IN THE CROP.

Turning in the crop is an operation which should receive as much attention as any other part of the practice of green manuring. The time and the method are two aspects which must be given strict consideration if the maximum benefit is to be derived from the crop.

Time to Turn In.

In the early spring, orchard trees require a free supply of moisture and nutrients to develop a strong blossoming and to ensure a good setting of fruit. Consequently, it can only be considered bad management to have a green manure crop standing so late as to compete with the trees for moisture at this stage. A further consideration is that decomposition of the green manure crop, after it is turned in, will proceed relatively slowly unless a plentiful supply of soil moisture is present. This decomposition of organic matter in the soil has the effect of producing a temporary shortage of available nitrates, the period of shortage being less in the case of leguminous crops than with other species, because of the greater quantity of nitrogen contained in plants belonging to this group. The shortage must be overtaken by the time the trees begin to bloom. Hence, as spring weather is usually dry, late turning-in must be avoided. On the oher hand, the maximum growth should always be received from each crop, so turning-in should not be done any earlier than necessary. As a general rule, cereal crops are ready by about the first week in August and leguminous crops by the third week. In seasons when good spring rains occur, crops may be allowed to grow a little later, but a close watch should then be kept on the soil moisture.

Method of Turning-in.

In the past, it has been the custom to plough in green manure crops so as to cover, as far as possible, the whole of the plant material. Such a method places bare soil on the surface. The more recent tendency is to develop a mulch of organic matter on the surface of the soil and this can be achieved only by shallow working. Implements such as tandem disc harrows and rotary hoes can be used to produce this effect, but they must not be allowed to penetrate too deeply. Just sufficient soil should be taken to incorporate the crop material in the surface layer and this is usually found to be about two inches. Operators of such machines must understand that the ideal finished surface is not one which is perfectly clean with no plant material showing, but one which is rough and has a large amount of mulch on the surface.

SUMMARY.

New Zealand blue lupin (legume) and Black Winter rye (cereal) are the most successful green manure crops to grow in the orchards of the Stanthorpe district.

The crops should be planted in January or early February.

Recommended fertilizer dressings are:—For legumes, 2½ cwt. per acre of 4:15:2 mixture; and for cereals, 1½ cwt. of sulphate of ammonia or its nitrogen equivalent in some other form. The fertilizer is best applied to the land before it is prepared for planting.

In soils which have not previously grown successfully a particular leguminous crop, the seed should be inoculated with the correct strain of nitrogen-fixing bacteria.

Early August for cereals and late August for legumes are usually found to be the correct times for turning in green manure crops.

The crop should not be completely buried but merely mixed in with the top 2-3 inches of the soil by shallow cultivation with such implements as tandem disc harrows and rotary hoes.

ORCHARD WINDBREAKS.

The advantage derived from shelter belts (windbreaks) where orchards are exposed to strong winds are not always fully realised. Not only is the loss from windfalls very great in orchards exposed to strong winds, but the growth and general health of the trees is adversely affected. It is not uncommon under such conditions to find the bulk of the crop of fruit carried on the sheltered side of the trees, on which side the wood growth also is stronger.

What variety of tree to plant as a windbreak requires careful consideration, as the trees chosen must fulfil certain requirements. They must make fairly rapid growth and reach a height and produce foliage of sufficient density to serve the desired purpose. The object of a windbreak is not absolutely to block the wind, as if this were done the wind passing over the top of the break would tend to at once drop or dip and strike the trees two or three rows back in the orchard. What is required is a break that will sufficiently slow down the speed of the wind that passes through it as to render it harmless. Another important requirement is that the trees of which it is formed shall not be subject to attack by scale or other pests to which fruit trees are subject. The cost of the young trees also should not be too high.

The windbreak should not be planted too close to the orchard; a distance of 30 feet or more is advisable. If sufficient land is available, a double row of trees, those in the second row being planted opposite the centres of the spaces in the first, is to be preferred to a single one. Where a double row is planted, the distance between the trees in the row can be increased. Rows 10 to 15 feet apart, with the trees 20 feet apart, will usually be found satisfactory. By keeping an open drain 5 or 6 feet from the windbreak its roots are prevented from robbing the orchard trees of plant-food and moisture.

It is sometimes found that, because of the planting of an unsuitable variety or as the result of planting the break too close to the orchard, windbreaks rob the fruit trees of much needed moisture. In such cases the windbreak roots extending into the orchard should be periodically cut and the top growth carefully lopped.

CO-OPERATION.

George H. Maughan, patron of the G.L.F., Ithaca, New York, said at a discussion at the American Institute of Co-operation at Purdue University:—

"Farmers need much more help than they are getting in developing a co-operative philosophy. We are not thinking of the academic methods and facts so often stressed by professional teachers. We have in mind the matter of participation—thinking, speaking, acting in local groups without stress on how this is done.

"Managers, all responsible employees of co-operatives, are the natural teachers and leaders in this work. They should assume the duties of educating and actuating their employers—the patrons. This takes wise, unselfish, statesmanlike leadership."

PLANT PROTECTION

Army Worm and Other Noctuid Outbreaks During 1946-47.

J. HAROLD SMITH, Senior Entomologist, and N. E. H. CALDWELL, Assistant Director of Horticulture.*

FROM time to time, some insects which are normally of only minor importance appear in countless numbers and cause considerable damage to crops. From this point of view, the summer of 1946-47 was remarkable in that three such species, two of them army worms, and the third, a cutworm, attracted attention during this period.

Insects Involved.

Three main species of the family *Noctuidae* were involved. This family of moths contains many important pests with a worldwide distribution. A few of them, such as the fruit-sucking moth†, which has the mouth parts strengthened to enable it to pierce fruit, are pests in the adult or moth stage but most are injurious in the larval stages which attack either the leaves or the stems of crop plants. The species under discussion are all of the latter type and the larvae of each have the characteristic habit of curling up, clock-spring fashion, when handled.

The common army worm‡ is the larva of a dull-brown or fawn-coloured moth with a wing span of about 1½ inches. It has a single black spot on the centre of each forewing. Eggs are laid on vegetation near the ground in compact groups. From these emerge small caterpillars which, after feeding for a week or so, become typical army worms with few distinctive features other than their gregarious habits. When full grown, they are about one and a half inches in length and dirty-grey to greenish-grey in colour, with several dark longitudinal stripes. At times, they are present in such large numbers that crops are attacked on a face by dense, moving swarms covering half an acre or more. Outbreaks usually occur in fodder crops though the pest has a very wide range of host plants. Outbreaks of this pest are most common on the Darling Downs.

The variegated army worm§ behaves in somewhat the same way as the common army worm and has rather similar habits. However, the parent moth differs in its colouration, for the forewings have a

* Formerly Entomologist, Science Branch.

† *Ophideres fullonica* L.

‡ *Sideridis unipuncta* Haw.

§ *Spodoptera exempta* Walk.

variegated pattern made of black, brown and grey markings. The caterpillars, too, are somewhat more distinctively marked, for light and dark coloured stripes run parallel along the whole length of the body. Though outbreaks occur in fodder crops, the pest attracts most attention in pastures. This may, however, simply be due to the fact that in the coastal areas, where outbreaks are most common, a relatively small proportion of the average farm is planted to fodder crops.

The greasy cutworm* is a cosmopolitan insect not normally regarded as a serious pest in Queensland. The parent moth has almost black forewings without any distinctive markings. Like the better known brown cutworm, eggs are laid on and among low-growing weeds in cultivated ground and the larvae emerging from them attack young plants both at ground level and sometimes above ground. The pest is usually noted in areas where market garden crops are grown extensively.

Conditions Favouring Noctuid Outbreaks.

The numbers of any pest vary a great deal from season to season and from year to year. The reproductive capacity of most insects is such that almost any species could become overwhelmingly abundant were it not for the interaction of such factors as competition for food, attacks by parasites and predators, and climatic checks which may either injure the insect directly or tip the scales in favour of its enemies. Climatic checks are particularly important, for it is well recognized in entomological practice that unusual weather, e.g., prolonged drought or unseasonable rains, may produce outbreaks of some pests which are generally considered of minor importance. Rainfall during 1945-46 was below normal throughout Queensland and the winter of 1946 was particularly dry in southern and central portions of the State. However, good spring rains fell in September. Therefore, outbreaks of several comparatively minor pest species were not entirely unexpected.

Most Noctuids spend the winter as pupae in the soil, where they are subjected to a number of risks. Temperature changes in a dry soil have little effect on their survival but winter rains are usually followed by a heavy pupal mortality below ground. The dry winter in 1946 was, therefore, an indication of possible spring outbreaks of some Noctuids. The spring rains of 1946 were very favourable for a moth emergence and larvae developing from the eggs laid by them found host plants in abundance on which to feed. Consequently they developed with little or no check. Later, in summer and autumn, outbreaks of serious proportions of the army worm, the variegated army worm and the greasy cutworm occurred as succeeding generations emerged.

The Common Army Worm Outbreak.

Though noted in several crops during October, the common army worm caused little damage and showed no signs of the gregarious habit exhibited in very bad outbreaks. In February, the first inkling of a serious outbreak came in a report from Warwick that larval swarms were present in some fodder crops there. In rapid succession, further reports of swarms were received from other parts of the Darling Downs. These indicated that the pest was most active in the area with Toowoomba, Clifton, Pittsworth and Bowenville as the main centres.

* *Agrotis ypsilon* Rott.

The picture presented by these reports may have been over-simplified, for the area concerned is intensively farmed and the importance of the pest would be proportionately greater than in districts further afield where properties are larger and cropping practices rather different. Outbreaks were reported as far afield as Millmerran and Jandowae but the data were insufficient to give a true picture of the position in these and intervening districts.

In the more intensively farmed areas, summer fodder and grain crops had been planted extensively and many had already reached or were approaching the heading stage during the February–April period when the pest was particularly active. These summer crops included Sudan grass, panicum, dwarf Setaria, white French millet and maize, all of which were attacked. One summer cereal, grain sorghum, was apparently not liked by the pest, for this crop remained more or less free from infestation even though it is grown extensively on the Darling Downs. On maize, the attack coincided with that of a better-known insect, the corn-ear worm*, and the two pests, working together, seriously injured both the flag and the flowering parts of the plant.

The common army worm feeds principally at night. During the day, it takes cover under debris on the ground and may even burrow into the surface mulch. Apparently, shelter during the day is more important than location, for on maize a large proportion of the caterpillars remained on the plant in the funnel leaves where they were partially shut off from direct sunlight. Occasionally, dense swarms showed some activity during the day, particularly in dull weather, but this habit was unusual. Normally, feeding began at dusk and continued during the night until the insects returned to ground level at daybreak. Though the leaves of the crop were sometimes stripped from the stem, the army worms showed a distinct preference for the younger and more succulent growth at and near the growing tip, particularly when the crop was coming into head. Thus, while the pest caused severe injury to fodder crops which were to be fed to stock or cut for hay, attacks were most serious in crops grown for grain.

One unusual feature of the outbreak was the even distribution of the insects within the infested crop. Dense swarms covering an acre or so were noted on several occasions, but, more commonly, three or four army worms would be feeding on every plant in crops covering fifty acres or more. Such behaviour on the part of the insect has been observed previously in maize but not in a district-wide outbreak such as that under discussion. Control measures in cases of this kind involved treatment of the whole crop rather than the destruction of a compact swarm of limited dimensions.

The common army worm is preyed upon by a wide range of parasites and predators and at least three which attack the larval or caterpillar stage of the pest came to farmers' notice during the outbreak. Ichneumonid wasps were prominent most of the time. These are fast-flying, rather slender-bodied and long-legged insects, half an inch to an inch in length, which, by means of a long ovipositor, lay their eggs within the bodies of well-grown caterpillars. The latter pupate normally but thereafter the parasitic larvae develop at the expense of the host which is finally destroyed. In due course, wasps of the next generation emerge from the army worm pupae.

* *Heliothis armigera* Fabr.

Another family of parasitic wasps, the Braconids, was represented by a small, black species* not more than one-eighth of an inch long. This parasite attacks the caterpillar in the same way as the Ichneumonids but in this case the host succumbs before reaching the pupal stage. At the approach of death, the larva usually crawls to some exposed situation. The parasite larvae—there may be a large number in one caterpillar—then emerge and immediately spin whitish silken cocoons about one-eighth of an inch in length. All the cocoons on one host are loosely bound together and it is these bundles of cocoons, sometimes fifty to sixty in number, and perhaps attached to the shrunken skin of the host caterpillar, which attract attenion.

A third species deserving mention is a large predatory beetle† belonging to the family *Carabidae*. The beetle is an active and conspicuous, shining, dark-green insect about an inch long and half an inch wide; its larva is rather longer, more elongate in shape and brown and yellow in colour. Both stages, which are ground-frequenting, savagely attack and devour army worm caterpillars. Though mainly nocturnal in habit, they may sometimes be seen operating during the day, particularly in dense crops.

The application of a poison-bran bait to army worm swarms proved very efficient. The bait recommended contains half a pound of arsenic pentoxide, twenty-five pounds of bran, four pounds of molasses and two and a half gallons of water, and was distributed in and around the infested area. The bait attracted the army worms and they died soon after feeding on it. Such baits are normally used on areas of one acre or less, but some farmers with an army worm infestation evenly distributed through the crop baited much larger areas though under such conditions the amount of bait used was below the normal rate of fifty pounds (dry bran) per acre.

Faced with the necessity of controlling a heavy, though disperse, infestation of the pest over large areas, attention naturally turned to the insecticide DDT. The interest in this insecticide was greatest among farmers with summer cereal crops in the heading stage for, given freedom from insect damage during the following month, they could expect a profitable crop of grain. As a crop return of say £10 or more per acre might be at stake, an application of an efficient insecticide at this particular period could be a good investment. It was already known that a DDT spray was toxic against some other Noctuid larvae and it seemed reasonable to suppose that army worms could be controlled with the insecticide. Accordingly, trials were made, using, in most cases, improvized power-operated spray outfits fitted with a multi-nozzle, horizontal delivery boom about thirty-five feet long and mounted on a truck. At a concentration of 0.1 per cent., DDT sprays appeared to give good results as many dead larvae were seen on the ground and damage seemed to fall off sharply following the treatment.

These attempts at control are of particular interest as an indication of the practicability of using insecticides on a large scale in field crops now that more efficient materials are available than was the case some years ago. The cost of the materials used on this occasion was approximately 7s. 6d. per acre, which is well within economic limits. The area of crop damaged by the truck wheels was of no importance compared with the total area treated.

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* *Apanteles* sp.

† *Calosoma australis* Hope.

The Variegated Army Worm Outbreak.

Outbreaks of the variegated army worm have previously been recorded from districts as far apart as the Atherton Tableland and the Queensland–New South Wales border but it is seldom that the tract of infested country has been as large as in 1947. In March, reports from the Clermont district told of "moving hordes of striped caterpillars" attacking pastures on station properties. The reference to the striped body pattern of the caterpillars leaves little doubt that the variegated army worm was involved. Shortly afterwards, grass paddocks were eaten out in the North Coast highlands at Maleny and from then on, southern Queensland experienced its worst attack from the insect for very many years. Native pastures as well as paspalum pastures were infested. In the former, the development of the outbreak was conspicuous for the grasses were mainly of the stooling type and the damage could be easily recognized as the work of caterpillars. Actually, the populations were so dense that, though the larvae normally sought shelter during the day, many remained exposed in pastures of this kind. In paspalum and some other established pastures which have a matted sward, the activities of the pest passed unnoticed until brown patches appeared in the field. The existence of such brown patches in the late summer and autumn when the grass should have been making good growth immediately suggested that something was wrong. Examination of the damaged grass and the underlying soil usually disclosed the variegated cutworm, sometimes in incredibly large numbers. These caterpillars, like those of the army worm, fed mainly at night on the flag and stems. The brown colour of the infested sward was largely due to the collapse and death of the flag; the roots remained alive unless the attack was very heavy and prolonged. The death of the grass over a large area was unusual, for some roots invariably survived and growth was resumed once the outbreak had passed, provided of course, soil moisture was sufficiently high.

The variegated army worm was attacked by numerous parasites, the most conspicuous being an Ichneumonid wasp*. This wasp is blackish brown in colour with a laterally-compressed, curved abdomen and a very long, egg-laying tube through which it inserts its eggs into the body of the full-grown or almost full-grown caterpillar. The activity of these wasps often gave a clear indication of the whereabouts of the caterpillars, for they flew to and fro just above the infested area, even before the pasture showed any signs of injury. Flights of the wasp were so common in Southern Queensland that they attracted attention in bowling and other greens which are kept under fairly close observation.

Outbreaks of the variegated army worm are usually short-lived, primarily because parasites and predators increase very rapidly and few of the caterpillars complete their development. In 1947, however, the outbreak extended over approximately two months and included at least two generations of the insect between late February and early May. The second generation caused the greatest damage and the position in the field was, therefore, most acute in late April.

A number of other insects were associated with the variegated army worm in some infested areas. The more important were the

* *Lissopimpla semipunctata* Kirby.

grass moth* and the cluster caterpillar†, the larvae of which have rather similar habits to those of the variegated army worm. For the most part, however, they played a minor part in the outbreak.

As in the case of the army worm outbreak on the Darling Downs, farmers could either let the variegated army worm outbreak run its course, or apply control measures for the pest. In pastures, the loss to farmers is less than it would be in fodder crops and the economic urge to apply control measures was seldom considered pressing. Where poison-bran baits were distributed, good control was obtained. However, control measures were needed for golf and other greens as well as gardens where the use of arsenicals is undesirable. DDT sprays were recommended for such situations and, in practice, gave excellent results when liberally applied at a concentration of 0.1 per cent. Usually a single application to the obviously infested areas and the margins thereof proved adequate to reduce the infestation to negligible proportions.

The Greasy Cutworm Outbreak.

Cutworm outbreaks occur every year in some crop or other. The commonest species is known as the brown cutworm‡ but there are many other Noctuids with cutworm habits and it was not until some of the larvae collected in the field were reared to the adult stage that the importance of the greasy cutworm in 1946-47 was realized. Most cutworms behave in the same way. The larvae usually feed at night and shelter during the day just below the surface of the soil. Normally, they attack seedling plants at ground level, eating into the stalk to such an extent that the seedlings collapse. They may, however, travel up the stem and attack the foliage, but this type of injury is more common in well-grown plants than in seedlings.

Last spring, cutworm damage to cultivated crops was very little, if any, greater than usual, though larger populations than normal were noted in some crops. The main species involved was identified as the greasy cutworm. In the autumn, however, outbreaks were recorded in all the more important fruit- and vegetable-producing areas south of Gympie. An unusual feature was the infestation in strawberry plantings, for this crop is not normally attacked by the pest. The root and crown of the strawberry plant are more or less fibrous and thus quite different from the succulent stems of the seedlings which are more commonly attacked. However, these parts of the strawberry plant escaped damage, the larvae feeding on the leaf stalks which were either severed at the base or so severely injured that the leaf collapsed. Extensive defoliation of this kind tends to delay fruiting, though it may not diminish yields. The delay may, however, prevent the farmer from marketing his crop when prices are most profitable.

Applications of poison-bran baits along the rows gave effective control of the greasy cutworm. However, the outbreak provided the farmer with an opportunity to use DDT sprays against the pest. The insecticide has been used at a strength of 0.1 per cent., the spray being directed downwards to the base of the plant where it wets the stem and the adjacent soil. The cutworms apparently make contact with the insecticide when they move about at night and results have, in practice, been uniformly good. It seems probable, therefore, that this method of controlling cutworms will, in future, supercede the rather more cumbersome, though still dependable, baiting technique.

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* *Psara licarsisalis* Walk.

† *Prodenia litura* Fabr.

‡ *Euxoa radians* Guen.

An Outbreak of Grass Webworm in Atherton Tableland Pastures.

R. C. CANNON, B.Sc.Agr., Entomologist, and A. HEGARTY, Q.D.A., Field Assistant.

A SERIOUS outbreak of the grass webworm* occurred on the Atherton Tableland in the vicinity of Peeramon in the early part of 1947, and was responsible for considerable destruction of pastures in that area. The insect has been recorded from various parts of the State, and an outbreak occurred in the Lockyer Valley in 1935. Webworms of related species are known in other parts of the world and sometimes attack cultivated crops, such as maize. In most cases outbreaks have been of a spasmodic, rather than recurrent, nature.

Life History and Habits.

The life history of this insect is not fully known. The adult (Fig. 1) is an inconspicuous, whitish-grey moth, fairly easily recognized by the projection of portions of the mouth-parts in front of the head, which is typical of Crambidae, the family to which this moth belongs. In repose the moth rests in a more or less vertical position, frequently clinging to upright grass stalks, with the wings furled around the body. It flies with a peculiar zigzag motion and flights rarely exceed a few yards at a time.

The eggs have not been observed, but presumably they are laid on the flag of the grass. In some species of this group, eggs may be laid during flight, when they fall and come to rest on the grass.

The young larvae (Fig. 2) are a dirty-grey in colour, with the segmentation of the body fairly distinct, and clothed with a few fairly stiff hairs. They make their way to the base of the young shoots of the grass, where they cut a more or less circular hole through the sheathing leaves and proceed to tunnel into the growing tissues. In doing so they cut off many of the younger leaves and eventually destroy the growing tip and flag. Apart from the initial perforation of the young shoots, they do not appear to consume the sheathing leaves, which simply collapse and remain on the surface of the stool. As they feed they produce a small amount of light webbing which helps to protect and conceal them. When fully grown, the larvae attain a length of about ½ inch and take on a darker colour, the segmentation of the body becoming still more conspicuous.

When fully fed the larva spins a more dense silken shelter in or near the base of the stool, where pupation takes place. The pupa (Plate 3) is brown in colour, about ½ inch long, and in general appearance much like many other moth pupae. From this pupa, the adult moth emerges to commence the next generation.

Seasonal Life History.

The damage in the Peeramon area was first apparent in February when the larvae were actively feeding and their presence was quite obvious. By March, large numbers of moths were on the wing and larvae were still in evidence in April, though their numbers had by

* *Calamotropha leptogramella*, Meyr.

Fig. 1.

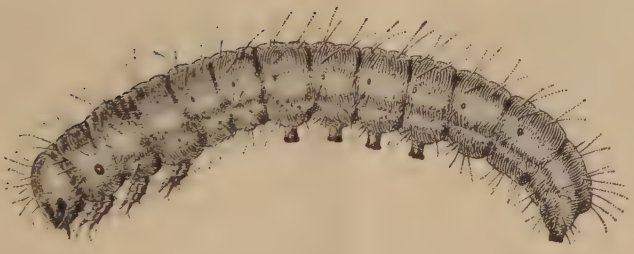

Fig. 2.

Fig. 3.

Plate 146.

Grass Webworm: Fig. 1—Adult moth × 6; fig. 2—larva × 8; fig. 3—pupa × 7.

this time declined considerably. It seems, therefore, that two generations must have occurred over the period February to April, when most of the damage was done. Odd larvae could still be found as late as June but the damage being produced at that time was negligible.

Some of the species which have been studied overseas are known to over-winter in the larval stage. Whether this is the case also with this species is not known, but it could quite well be so.

Natrue and Extent of Damage.

In the outbreak in question the grass affected was paspalum,* the principal pasture species in the Malanda area. In feeding the larva does not consume the flag but concentrates on the base of the growing point, producing a more or less spiral excavation of these tissues (Fig. 4). The growing point is effectively destroyed and no further growth takes place, the sheathing leaves dying back as a result of the injury sustained by them. Though it is not certain, it is presumed that a single larva may feed on more than one growing point, destroying several during the period of its actively feeding life.

Fig. 1.

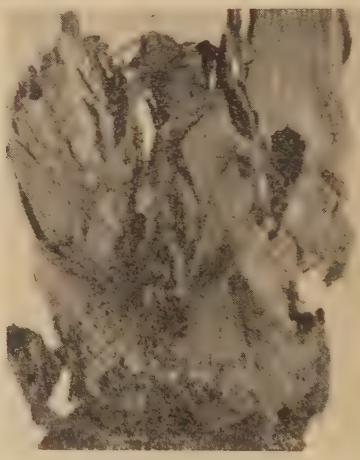

Fig. 2.

Plate 147.

PASPALUM SHOOTS DAMAGED BY GRASS WEBWORM.—Note circular holes made by the larvae. Fig. 1—front view; fig 2—side view.

The grass affected fairly quickly assumes a browned-off appearance consequent on the destruction of young growth and the natural death of older leaves. For a time the dead tissue remains in place, but, due to the action of wind and weather, gradually disappears exposing the browned stolons. In many respects the pasture presents much the same appearance as that associated with white-grub† activities but closer examination shows that the root system is intact. In addition, it has not the ruffled appearance of white-grub infested pastures. In the outbreak under discussion it was noted that there was often an overlapping of grass webworm and white-grub infestation. In some areas the pastures showed symptoms of both types of injury, whilst in others the damage was entirely due to the webworm.

* *Paspalum dilatatum.*

† *Lepidiota caudata,* Blkb., etc.

The outbreak was centred in the area in the vicinity of Peeramon, where the most spectacular damage occurred. In the Mt. Quincan–Kureen–Peeramon triangle of country the pasture damage was almost entirely due to the activities of the grass webworm, whilst on adjacent areas the webworm was responsible for damage of a lesser magnitude. It has been estimated that the pest was present in some 5,000 acres of grassland in the area, though probably only half of this area was heavily infested and suffered severe injury.

In view of the fact that the root system had been in no way impaired, it might have been expected that recovery would be more rapid than in pastures attacked by white grubs. Unfortunately, the outbreak did not subside until after the cessation of the monsoonal rains, and conditions were then not favourable for a rapid recovery. Following light rains in May, odd green shoots appeared in previously damaged pastures but recovery was extremely slow and little further improvement took place before the spring rains. On the other hand, weed growth has proceeded more or less unchecked and may become an important factor in retarding grass recovery. The principal weeds in the succession were star burr, blue top and farmer's lice*.

Predisposing Factors and Natural Control.

The species in question is native to Australia and is normally heavily parasitized. There is reason to believe that this insect is present each season in the Peeramon area without causing any spectacular damage, presumably due to the controlling influence of parasites. The months prior to the webworm outbreak of 1947 were exceptionally dry, the Atherton rainfall for the period November, 1946, to January, 1947, being 749 points as against an average of 2,160 for the same period. It is considered that this abnormally dry period may have so interfered with parasite survival as to allow the pest temporarily to get out of hand. This explanation probably accounts for the long periods between outbreaks of the webworm in Queensland, and it may be many years before a similar outbreak occurs.

Control.

Insecticidal control of this pest is possible though, perhaps, difficult at times on account of the nature of the terrain. Control may be effected by the application of a 0.1 per cent. DDT spray or a 2 per cent. DDT dust to affected areas; the strengths of DDT are given in terms of the para para isomer content. Similar results may also be expected with Gammexane dust (with a 0.4 gamma isomer content) when this material becomes available commercially. On account of the sporadic nature of the outbreaks, no full-scale insecticidal trials have been possible, but a small-scale trial has proved these insecticides very effective.

Successful and economic control of the pest will depend very largely on early recognition of the trouble and prompt application of control measures. Once the attack has spread a considerable area of country may be involved and the cost of insecticides and their application may become excessive. It is considered that a single early application of one of these insecticides may be expected to bring an outbreak under control in a short space of time.

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* *Acanthospermum hispidum*, *Ageratum conyzoides* and *Siegesbeckia orientalis*.

PRODUCTION RECORDING.

List of cows and heifers, officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of October, 1947 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard 350 lb.).				
Tara Tia 4th	C. K. Roche, Wheatvale	9,140·75	358·806	Murrays Bridge Pansy's Gift
Junior, 4 Years (Standard 310 lb.)				
Tabbagong Lucy 20th	J. Crookey, Allora	10,482·75	381·802	Park View Paymaster
Senior, 2 Years (Standard 250 lb.).				
Navillus Shannon 11th	C. O'Sullivan, Greenmount	8,366·95	336·236	Greyleigh Eros
Junior, 2 Years (Standard 230 lb.).				
Arolla Beauty 9th	J. Crookey, Allora	6,293·85	248·456	Fairthorn Rainbows Prince
JERSEY.				
Mature Cow (Standard 350 lb.).				
Gem May (365 days)	W. Bishop, Kenmore	15,065·2	923·607	Ardroy Laces Volunteer
Brookland Sultana Cake	W. S. Conochie, Sherwood	8,377·75	492·786	Brookland Royal Sultan
Junior, 4 Years (Standard 310 lb.).				
Glenrandle Nisa 2nd (251 days)	P. Kerlin, Killarney	7,186·8	381·973	Bellgarth Stylish
Lilyvale Brown Lady	I. Jensen, Stockyard Creek	6,128·3	325·209	Carfield Curly's Master
Junior, 3 Years (Standard 270 lb.).				
Glenrandle Larkspur (251 days)	P. Kerlin, Killarney	8,218·4	442·66	Bellgarth Glory King
Nairfale Neat Neta	R. J. Browne, Yangan	6,928·8	386·02	Nairfale Count Paymaster
Wattle Vale Doreen	I. Jensen, Stockyard Creek	5,693·85	316·281	Winera Pansys Officer
Bellgarth Lily Light 2nd	D. R. Hutton, Cunningham	5,657·3	308·391	Oxford Fawn's Victor
Wattle Vale Pansy	I. Jensen, Stockyard Creek	5,442·25	305·851	Winera Pansys Officer
Junior, 2 Years (Standard 230 lb.).				
Trinity Bright Lass	J. McCarthy, Greenmount	5,204	250·392	Trinity Crowning Effort
Hopewell Vanity	G. Harley, Childers	4,966·45	248·355	Trinity Daffodil's Design
Wattle Vale Duchess	I. Jensen, Stockyard Creek	4,560·85	237·694	Sunny Glen Lucky Boy

MARKETING

Production Trends, November.

Seasonal storm rains occurred at frequent intervals throughout November, and by the end of the month practically all farming and dairying districts had received better than average rains.

Milk and cream supplies are at a high level and are increasing. The smothering of cream-tainting weeds by the luxuriant pasture growth has caused almost a complete absence of weed-tainted cream. Some cream supplies are being down-graded because of the failure of producers to take adequate precautions against hot-weather deterioration.

Wheat harvesting commenced late in October, and good progress was made during November under generally favourable conditions until late in the month when the continued heavy rains made harvesting impossible. Yields were particularly high in many districts and although some losses will be occasioned by the wet conditions it is not possible at this stage to assess what damage has been done to the crop.

Interest in peanuts has increased in all areas where this crop can be grown, and a record planting is assured. To date 45,000 acres in the South Burnett and 5,000 acres in the Monto districts have been planted, and planting is continuing.

Harvesting of the linseed crop on the Darling Downs is expected to commence immediately. The crop appears to be suitable for the district and promises yields of approximately 4 bags. Improved yields may be expected when the crop becomes acclimatised.

Sorghum Growers' Voluntary Pool.

In November, Queensland sorghum growers formed a Co-operative Association to handle the sale of the surplus sorghum resulting from last season's record crop, which remained in growers' hands. The Commonwealth Government has agreed to grant an export permit up to 600,000 bushels, and has requested the Queensland Department of Agriculture and Stock to supervise the export arrangements.

Export permits will be issued exclusively to The Sorghum Growers' Co-operative Association Limited, and this Association will be required to accept into the pool any grain sorghum of merchantable quality of the 1947 harvest delivered by a sorghum grower. The Association will be required to pool and to sell all grain on behalf of the growers either on the local or the export market, and to return the net proceeds of sales to the growers concerned in accordance with the grades and qualities of grain delivered.

Potato Marketing Board.

It has been announced by the Minister for Agriculture and Stock (Hon. H. H. Collins) that Messrs. M. W. Reeves, Imbil; C. F. Giffard, Home Hill; T. J. Ford, Gatton; W. Utz, Mount Tarampa; and J. J. Dwyer, Gap View, via Kalbar, have been elected as growers' representatives on the Potato Marketing Board for the three-year term commencing 1st January, 1948. The counting of votes, which took place at the Department of Agriculture and Stock on 18th December, 1947, resulted as follows:—

	Votes.
District No. 1—Central.	
M. W. Reeves, Imbil	186
G. F. A. Beitzel, Murgon	167
District No. 2—Northern.	
C. F. Giffard, Home Hill	94
J. McF. Blyth, Woodstock	31
District No. 3—Southern.	
T. J. Ford, Gatton	921
W. Utz, Mount Tarampa	903
J. J. Dwyer, Gap View, via Kalbar	871
F. H. Steinhardt, Gatton	671

GENERAL NOTES

Staff Changes and Appointments.

The following appointments in the Division of Plant Industry, Department of Agriculture and Stock, have been announced:—

Dr. L. G. Miles, B.Sc.Agr., Ph.D., Senior Plant Breeder in the Division, has been appointed Senior Plant Breeder, Agriculture Branch. Dr. Miles was granted a scholarship in Plant Breeding at the Queensland University in 1930 and subsequently travelled abroad for further training in America and England. Whilst overseas, Dr. Miles obtained his Doctorate in Philosophy at Cornell University (New York). He took up his appointment as Plant Breeder in the Department in 1934.

Mr. W. J. Cartmill, B.Sc., A.A.C.I., Soils Chemist, Division I., Agriculture Branch, has been appointed Senior Soils Technologist, Agriculture Branch.

Mr. W. J. S. Sloan, M.Sc.Agr., Agronomist, Division I., Sugar Experiment Stations, has been appointed Senior Agronomist, Agriculture Branch.

In the Division of Animal Industry, Messrs. R. B. Young and H. D. Hallam have been appointed Senior Advisers, Sheep and Wool Branch. Mr. Young will be stationed at Longreach and Mr. Hallam at Dalby.

Mr. J. N. Rea has been appointed Adviser, Sheep and Wool Branch.

The following appointments in the Bureau of Sugar Experiment Stations, Division of Plant Industry, Department of Agriculture and Stock, have been announced:—

Mr. L. G. Vallance, M.Sc., Chemist, Division I., has been appointed Senior Soils Technologist;

Mr. J. H. Buzacott, M.Sc., Entomologist, Division I., has been appointed Senior Plant Breeder; and

Mr. George Wilson, B.Sc., has been appointed Entomologist, Division II., on probation, with headquarters at the Sugar Experiment Station, Meringa, near Gordonvale.

Cane Growing Assignments to Ex-Servicemen.

Commenting on the granting of cane-growing assignments to discharged servicemen under *The War Service (Sugar Industry) Land Settlement Act of* 1946, the Minister for Agriculture (Hon. H. H. Collins) said recently that he had been informed that, following submissions by the Land Administration Board regarding the settlement of ex-servicemen in four mill areas, viz., Mulgrave, Babinda, Mossman, and Hambledon, the Central Sugar Cane Prices Board, after due consideration, has decided that it is prepared to approve of assignments affecting 82 growers in these areas. Fifty assignments have been approved for landless ex-servicemen, 24 for landholders, or holders of an option on approved land, and 8 increases in assignments. It is computed that these additional assignments would provide for an increase in production of some 53,000 tons of cane.

Mr. Collins added that where Crown land was involved the Land Administration Board would hold a ballot among eligible applicants, and when the said lands are allotted assignments would be granted. The Central Sugar Cane Prices Board would issue assignments to successful applicants in all categories on being advised by the Land Administration Board that such successful applicants hold a lawful title to the land to be assigned. Consequently, the eligible holders of approved land or options, and approved applicants for increased assignments would be enabled to get into production at an early date.

"It was interesting also to note," said Mr. Collins, "that under the priority of purchase provisions of the Act, 164 farms had already been secured by eligible ex-servicemen, and in many of those cases finance was provided by the Agricultural Bank."

Rural Topics

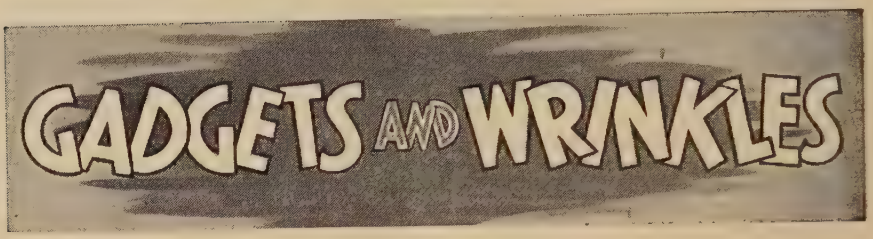
Lessons from Denmark.

Denmark is a country which has a lot of interest for many Australian farmers, probably because agricultural co-operation and education are so highly developed there. As a dairying country, Denmark also is, or, rather, has been (and probably will be again) one of our keenest competitors on the British butter market. We are indebted to Denmark for the valuable lessons in marketing methods and organization along the lines of practical farmers' co-operation. What is happening in Denmark to-day, what are the farming conditions there now, and how is she recovering from the German occupation?

Denmark has resumed the exportation of primary products to Britain and reorganization is under way with the object of re-establishing the pre-war volume of consignments to the British market. Denmark is in full production again, and with the effects of the war and the long German occupation forgotten. Can Denmark still give a lead in general farming practice and in the fields of research and education? It is a little nation with a big reputation and, in area, not very much larger than one of our more extensive North Australian cattle stations. The population is about 4 millions, of whom about a fourth live in its capital city, Copenhagen.

Farming in Denmark is on an intensive scale. The average size of a Danish dairy farm is from 40 to 50 acres, carrying up to 25 cows. A farmer who owns 100 acres is the big man of his district, but such an area would be subdivided into farming units, each supporting at least one family. Dairying in Denmark is hardly comparable with dairying in Queensland, because of the severity of the Jutland climate. For about six months or so of every year cattle have to be housed and stall fed. During the other half of the year the cattle are on sown pasture, made up, in addition to grass, largely of clover, lucerne, and green oats. Each cow is tethered on a chain about 10 to 12 yards long, a steel spike being driven into the ground as an anchor and the whole herd extended across the field in a straight line. Each morning the line is moved forward a further 10 or 12 yards, and so the procedure is repeated until the whole paddock is eaten out. The cattle are then moved to another paddock, and so the process goes on. When back in the stalls for winter housing, the cattle receive a regular balanced ration, to which is added brewers' grains and cereal meals and other available feeds. Pig raising, regarded as of equal importance, is combined with dairying. Tiny flocks of sheep and working horses are usually included in the farm stock. Agriculture is combined, of course, with the pastoral side of the farm, and every farm has normally the greater proportion of its acreage under crop. In general, the farm area is divided into eight equal parts, and a most efficient system of crop rotation is practised. Each year a different crop is sown, and practically about seven-eighths of the farm is ploughed annually. Denmark has mostly maintained its productivity by the careful use of natural manure and systematic rotation of crops.

The amount of modern agricultural research carried on in Denmark is remarkable for its thoroughness and its application to farming the world over. Throughout the country there is an efficient system of Government-sponsored agricultural schools. These schools are situated in the heart of the farming areas and are worked in conjunction with a good farm. The primary object of these schools is to provide practical, theoretical, and technical education to farmers' sons and farm workers while they are actually engaged in farming. Fees are very low, and are based on a sliding scale. The co-operative principle is applied to Danish rural industry in every practical way, including long and short-term credits, and extends to the co-operative control and use of farm machinery. In Danish farming one fact stands out boldly, and that is: the highest standard of quality is the hallmark of the primary commodities they send to the export market—a fact well worth full appreciation in respect of a serious competitor in our own export trade in primary products.



TANK SINKING.

The drains leading to a tank should be wide and shallow rather than narrow and deep, the flow of water in a shallow drain being slower and the amount of scouring consequently less. A drain 4 feet wide and 9 inches deep is much better than one 2 feet wide and 18 inches or 2 feet deep.

When scouring is likely to take place the following method is very successful in preventing it:—

A trench about 1 foot wide and 18 inches deep, and extending a couple of feet each side of the drain, is dug across it and filled with stone of 2 or 3 inch gauge. The efficacy of aprons such as this can be seen along roads and railways where they are used for the prevention of wash-aways.

Where drains curve they should be widened; the sharper the curve the greater should the width be, and as a double safeguard an embankment can be placed on the outer side. Should drains meet before reaching the tank the main drain should be widened at the confluence, and the junction made at an acute angle. Otherwise considerable quantities of silt will settle.

It is highly desirable that the drains be run as far as possible on an even grade, and an ordinary home-made level such as used in erosion work is ideal for securing a regular and even grade. Its use would obviate much of the erosion and silting so often seen in drains leading to tanks. Further, properly constructed and gently sloping drains tend to serve a larger catchment area than if an attempt is made to slope the drains steeply and to rely entirely upon the eye for their placement, etc.

Drains should always be kept in first-class order. When surface tanks are depended upon every shower is of importance, and unless the drains are clean, water from light showers does not reach the tank. Light road delvers are very useful for cleaning drains, but if the size of the holding does not warrant the purchase of such a delver, a crowder or delver should be made from a log or plank by the fitting of a steel point. A plough or shovel can also be used for this purpose.

On small holdings, where the tanks can be kept under observation, some means should be devised to divert the water as soon as the tank is full. If the water is allowed to continue to flow into the tank it gradually silts up, and the water which overflows is clearer than the water which is flowing in.

A chute should be provided where the pipe enters the tank, and a drain made right round the edge, leading to the chute, for the purpose of preventing water from running down the banks and causing scouring.

Usually one silt tank is provided, but it is a decided advantage to have two or more, as then more silt is deposited and the water reaches the tank in a cleaner condition. Every possible opportunity should be seized upon to keep the tanks clean. They should be kept under constant observation, and whenever the water gets low as much silt as possible should be removed. Many landholders have discovered at the commencement of a drought that tanks which they had thought contained several feet of water actually contained several feet of silt and only a few inches of water.

Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

BETWEEN TWO YEARS AND SIX—THE RIGHT HEALTH HABITS.

Exercise and Play.

All good parents are anxious that their boys shall grow up strong, healthy young men and their girls into attractive, healthy young women.

Having the right kind and amount of exercise and play is one of the first health habits which should be developed. Children who are well should play as long as possible every day in the open air. When the weather does not permit of going outdoors they should play on a sheltered veranda or in a room with the windows open. Active play is most important for children because it—

1. Makes the heart beat faster, speeding the flow of blood through the body and thus carrying more food to all the tissues and accelerating the output of waste matter through the skin and other organs.
2. Makes the child breathe faster and more deeply, thus bringing more air into the lungs and more oxygen into the blood.
3. Increases the appetite and helps digestion.
4. Helps make the muscles firm and strong, aids in correct posture and gives grace to movement; develops skill and self-control.

Play is the child's way of expressing himself and he should have plenty of play material. This does not mean expensive toys. For outdoors there should be provided sand, water, swings, climbing frames, carts and other toys which will move; indoor for wet days or to help the recovery of a sick or undernourished child, toys 'that will develop a skill and keep the child interestel, like blocks, finger paints, counting trays, peg boards, and so on.

Walking should be encouraged and made interesting by pointing out the beauties of nature and explaining to the children the things which they see around them on their walks. Teach them to enjoy the wind and the soft rain on their faces and the warmth of the sun on their bodies. All children should be taught to swim and as they get older should join in team games like cricket and tennis.

Parents of only children should remember that every child needs the company of other children. The joy of exercise and play is greatest when he plays with children of his own age.

Do not allow children to exercise to the point of being overtired. A little rest with or without sleep after exertion will help to prevent over-fatigue in the very active child. Early health habits help to maintain fine mental and physical condition in later life.

Any advice on play for children of different ages and any other matters concerning the health of mother and child may be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

NURSING AS A CAREER FOR COUNTRY GIRLS.

To become a nursing trainee a girl must be no younger than 17 years and have attained the State School 7th Grade, or its educational equivalent. Any girl with higher educational attainments seeking a professional career leading to a position of administrative responsibility would find in trained nursing the way of achieving her ambition. The period of training for a general trained nurse is four years. The study course is very interesting, the knowledge gained being of inestimable value in all walks of life whether a girl continues in the nursing profession or not. The commencing salary for a trainee of 17 years of age is £1 13s. 9d. a week, with yearly increases during the period of training. Trainees are provided with excellent accommodation in the Brisbane Hospital (also in other base hospitals), separate rooms being provided in the Nurses' Home block in the hospital grounds. A large recreation room with piano, wireless set, sewing machines, and library are provided for the use of nurses, as well as adequately equipped lounges. Meals of a high standard. Bathrooms are supplied with hot and cold water. Accommodation, meals, and uniforms are provided without charge. Uniforms also are laundered without charge.

On the successful completion of her period of training a nurse may, if she so desires, enter on a short course of training (9 months) to qualify as an obstetric nurse and may thus become a "double certificated" nursing sister, qualified for appointment to any position (including that of matron) in any hospital.

Opportunities for travel are available to trained nurses, and because of reciprocity of registration among Australian States and overseas countries they are assured of positions in most countries.

The Brisbane and South Coast Hospitals Board, *Brisbane Base Hospitals Post Office, Herston road, Brisbane,* will supply further particulars to any girl who is considering nursing as a worthwhile career.

IN THE FARM KITCHEN.

Stuffed Pancakes.

Half pound sausage meat, 1 teaspoon parsley, or half of mixed herbs, 1 teaspoon meat extract, a little onion or leek, salt and pepper. Fry the onion in a little fat, and add the sausage meat. Mix them together in the pan, stir in the meat extract, salt and pepper, and the parsley or herbs. Moisten with a little boiling water and allow to simmer gently. The sauce (about two teacups of ordinary white sauce, made with milk and two tablespoons of grated cheese stirred in) will keep warm while you make six very thin pancakes, using your usual egg batter. As you finish each pancake fill it with the stuffing mixture, roll it up ond put it in a hot fireproof dish. Arrange the pancakes in a neat row, pour over the sauce, and put the dish in a hot oven, or under the grill, for ten minutes. Enough for three or four persons.

Casserole of Mutton.

One and a half pounds neck of mutton, ½ pint diced carrot, 1½ gills diced turnip, 2 oz. butter or mutton fat, 2 level tablespoons plain flour, salt and white pepper to taste, ¾ pint mutton stock. Divide the meat into neat chops or cutlets. Prepare vegetables. Melt the fat in a frying-pan until it starts to smoke. Dip vegetables in the flour, then add. Fry slowly till turning colour. Remove to casserole. Sprinkle chops or cutlets with salt and pepper. Fry on both sides in remainder of fat in frying-pan. Turn chops into casserole. Add stock. Cover closely. Simmer until tender on top of stove with an asbestos mat between casserole and ring or hot plate, or bake in a slow oven for about two hours. Serve with boiled or mashed potatoes. Enough for five or six persons.

QUEENSLAND WEATHER IN NOVEMBER.

During November there were relatively few places in the Carpentaria and western border districts of the State which received little or no benefit from the otherwise state-wide distribution of a series of seasonal thunderstorms, which by the end of the month resulted in aggregate totals of several inches in many districts of the south-eastern quarter, particularly the Downs and south coast areas. Variable thunderstorm rain weather again mainly in the south-east divisions, continued for the first three days in December, and there were also useful supplementary falls in parts of the Carpentaria, most of the Central Highlands and central coast districts.

In the wheat areas the heaviest rain came towards the end of the month, and, although the greater part of the harvesting had been completed, poorer results from local storm damage and unstripped water logged areas would decrease to some extent the previously estimated record yield of 11 to 12 million bushels.

With the latest improvement in the central coast areas, the greater part of the State, especially the southern half, has experienced a good to exceptional spring season with ample general pastures, higher milk yield and favourable agricultural conditions. Fruit setting and early ripening crops of the Granite Belt were hampered by the excessive rain and some local storms.

Local heavy thunderstorm rains, with some hail damage, were reported with the worst conditions at Charleville on Sunday, 23rd, when a terrific hailstorm was accompanied by 66 m.p.h. winds. The storm on a four mile front lasted 17 minutes and caused damage estimated at £150,000. Practically all windows were broken, iron roofs dented and penetrated, some poultry and animals killed, and several persons injured. Hail stones as large as 5 inches in circumference were measured.

Some heavy daily falls included 351 points at Mossman (19th); Charleville 269, Muckadilla 266, Dulacca 261 (24th); Bell 341, Macalister 300, Moore 338, Yarraman 323 (29th), Giru 368 (29th), Gympie 347 (30th).

High monthly totals in the South Coast Moreton included many five to eight inch amounts, up to 1,124 points at Gympie and 1,039 at Theebine. In the Port Curtis district Goodwood registered 899 points and Rosedale 969. The East Downs ranged from three to over seven inches, up to 913 points at Warra and on the West Downs Condamine and Columboola had 544 points, and in the Maranoa, Yuleba 563.

Stream rises Downs and South Coast.—Apart from local district flooding in low-lying areas, by the end of the month heavy aggregate rains had steadily increased general stream flows, and by the 2nd December some moderate flood heights were reported from the Condamine and Macintyre basin, and at Murrumba on the Brisbane River on the 3rd December flood height over the bridge resulted, chiefly from heavy rain on the inland watershed.

Temperatures.—Apart from slightly above normal readings in the Palmerville-Georgetown districts, maximum temperatures were generally below normal from 1.5 degrees at Cairns to 3.8 deg. at Thargomindah. Minimum temperatures also, except at Cairns and Palmerville, were also mostly well below normal, as much as 4.3 degrees at Thargomindah. Camooweal recorded over 100 degrees on 17 days, and Donors Hill and Richmond 15. Normanton reported 108 degrees on the 11th and 17th. Bybera and Stanthorpe reported a grass minimum temperature of 32 degrees (6th).

Brisbane.—Mean pressure $\frac{9 + 3}{2}$ 29.913 inches (normal 29.958). Temperatures—Mean maximum 78.6 deg. (normal 82.3 deg.), lowest since 1933 (76.6 deg.). Mean minimum 63.2 deg. (normal 64.3 deg.), lowest since 1935 (63.2 dep.). Mean temperature 70.9 deg. (normal 73.4 deg.), lowest since 1933 (70.0 deg.). Highest daily reading 89.7 deg. (4th); lowest 57.0 deg. (12th). Rainfall—280 points on 12 days; Sunnybank 157 points in less than half an hour with some hail in south-west suburbs as large as pigeons' eggs. 30th, 9.13 p.m., wind gust of 53 miles per hour from S.S.E. in heavy thunderstorm.

The rain position is summarised below—

Division.	Normal Mean.	Mean November, 1947.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	199	99	50 below
Peninsula South	220	168	24 ,,
Lower Carpentaria	148	155	5 above
Upper Carpentaria	153	135	12 below
North Coast, Barron	298	391	31 above
North Coast, Herbert	353	460	30 ,,
Central Coast, East	206	219	6 ,,
Central Coast, West	161	347	116 ,,
Central Highlands	220	191	13 below
Central Lowlands	148	196	32 above
Upper Western	105	58	45 below
Lower Western	89	32	64 ,,
South Coast, Port Curtis	272	518	90 above
South Coast, Moreton	357	541	51 ,,
Darling Downs, East	277	435	57 ,,
Darling Downs, West	232	479	106 ,,
Maranoa	211	384	82 ,,
Warrego	147	236	61 ,,
Far South-West	109	133	22 ,,

Commonwealth of Australia Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

JANUARY.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4.56	6.46	Cairns	48	9	Longreach	43	27
6	5.00	6.47	Charleville ..	29	25	Quilpie	33	37
11	5·04	6.47	Cloncurry	63	36	Rockhampton ..	18	2
16	5.08	6.47	Cunnamulla ..	28	31	Roma	19	15
21	5.12	6.46	Dirranbandi ..	16	22	Townsville	40	9
26	5.16	6.45	Emerald	27	12	Winton	51	30
31	5.20	6.43	Hughenden ..	48	22	Warwick	2	6

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	10.42	9.22
2	11.17	10·27
3	11.49	11.29
		p.m.
4	..	12.28
	a.m.	
5	12·22	1.27
6	12.55	2.25
7	1.30	3.23
8	2·09	4.21
9	2.52	5.17
10	3.39	6.10
11	4.31	6.59
12	5·25	7.44
13	6.20	8.23
14	7.15	8.58
15	8.09	9.30
16	9.02	9.59
17	9.55	10.28
18	10.48	10.57
19	11.43	11.28
	p.m.	a.m.
20	12.40	..
21	1.41	12.02
22	2.46	12.41
23	3.53	1.27
24	5.01	2.22
25	6.05	3.25
26	7.03	4.35
27	7.52	5.48
28	8.35	7.00
29	9.13	8.10
30	9.48	9.15
31	10·22	10.18

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19;
Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	15	24	31	40	6	16	35	47
6	24	13	41	28	16	3	47	32
11	30	10	46	24	21	0	53	27
16	23	16	39	32	14	8	45	36
21	13	25	28	41	3	16	31	47
26	11	29	26	44	1	20	29	52
31	21	18	38	34	12	9	43	38

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	20	41	44	58	29	44	18	35
3	31	30	51	50	35	35	25	25
5	36	19	55	43	40	28	30	17
7	46	9	62	36	47	22	38	9
9	53	4	67	33	50	19	44	5
11	55	4	68	33	51	19	45	5
13	51	9	65	36	49	22	42	9
15	43	17	59	42	44	27	36	16
17	34	27	53	48	38	33	28	23
19	23	37	46	56	30	41	20	32
21	13	42	39	59	24	44	12	36
23	6	51	35	64	20	50	6	43
25	5	55	35	67	19	52	5	45
27	12	48	38	62	23	48	11	40
29	23	38	46	56	30	41	20	33
31	34	26	54	47	38	33	29	22

Phases of the Moon.—Last Quarter, January 3rd, 9.13 p.m.; New Moon, January 11th, 5.44 p.m.; First Quarter, January 19th, 9.32 p.m.; Full Moon, January 26th, 5.11 p.m.

On January 15th the Sun will rise and set about 23 degrees south of true east and true west respectively, and on January 3rd, 18th, and 30th the Moon will rise and set approximately at true east and true west respectively.

Earth in Perihelion.—On January 2nd the earth will reach that part of its orbit at which it will be nearest the Sun. There will then be 91¼ million miles between the two bodies.

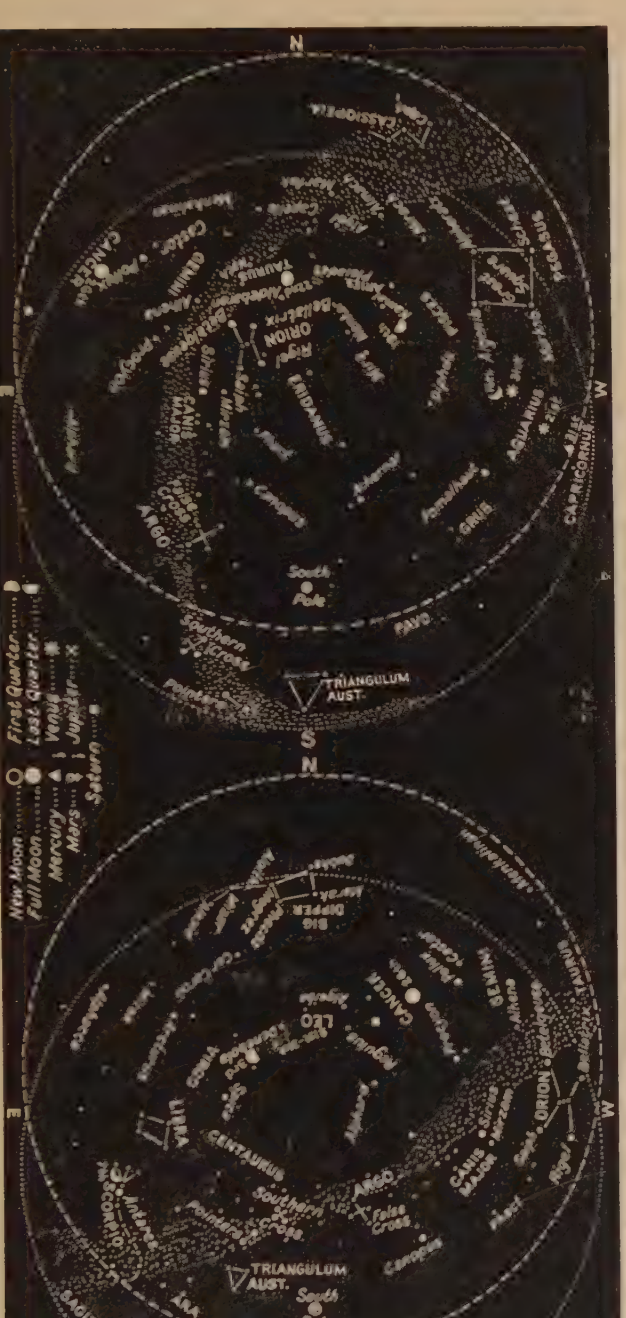
Mercury will not be visible until the later part of the month, being in line with the Sun on the 3rd. At the end of the month, in the constellation of Aquarius, it will set 1 hour 21 minutes after the Sun.

Venus, at the beginning of January, in the constellation of Capricornus, will set about 2 hours after the Sun, and by the end of the month will have almost passed through the constellation of Aquarius, when it will set between 8.30 p.m. and 9.45 p.m.

Mars during this month, in the constellation of Leo, will not show much movement in relation to the stars, being stationary on the 9th. On the 1st it will rise between 10 p.m. and 11.15 p.m., and on the 31st will rise between 8 p.m. and 9.15 p.m.

Jupiter, in the constellation of Ophiuchus, may be seen low in the east during morning twilight, rising 1¾ hours before the Sun on the 1st and nearly 4 hours before the Sun on the 31st.

Saturn.—This planet and Mars will be about equal distances on opposite sides of Regulus. On the 1st Saturn will rise between 9.15 p.m. and 10.15 p.m., and on the 31st between 7 p.m. and 8.15 p.m.



Star Charts.—The chart on the right is for 8.15 p.m. in the south-east corner of Queensland to 9.15 p.m. along the Northern Territory border on the 15th January. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 7 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold "N" at the bottom; when facing south hold "S" at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another, moving east to west, arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th, and at the end of the month about one hour earlier than that time. The positions of the moon and planets, which are continually changing in relation to the stars, are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

NOVEMBER RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of years' records.	Nov. 1946.	Nov. 1947.		Nov.	No. of years' records.	Nov. 1946.	Nov. 1947.
North Coast.	In.		In.	In.	*South Coast—cont.*	In.		In.	In.
Atherton	2·60	42	1·05	5·47	Gatton College ..	2·87	44	1·27	6·04
Cairns	3·81	61	1·18	4·70	Gayndah	2·97	72	2·93	2·93
Cardwell	4·14	71	1·93	7·24	Gympie	3·33	73	1·34	11·24
Cooktown	2·45	67	Nil	1·32	Kilkivan	2·66	62	0·99	5·57
Herberton	2·68	57	0·66	5·70	Maryborough ..	3·20	72	1·47	5·06
Ingham	3·75	51	0·44	3·19	Nambour	4·21	47	1·50	7·73
Innisfail	6·25	62	2·21	5·15	Nanango	2·86	61	2·55	5·16
Mossman	5·75	19	1·78	4·65	Rockhampton ..	2·43	72	2·89	4·24
Townsville	1·87	72	0·16	5·90	Woodford	3·29	55	1·75	5·50
Central Coast.					*Central Highlands.*				
Ayr	1·67	56	0·28	2·87	Clermont	2·15	47	1·93	2·50
Bowen	1·24	72	0·34	0·79	Springsure	2·39	74	1·25	1·91
Charters Towers ..	1·43	61	1·17	3·86					
Mackay	3·05	72	0·60	2·70	*Darling Downs.*				
Proserpine	2·82	40	0·76	3·02	Dalby	2·80	73	1·48	7·11
St. Lawrence ..	2·40	72	1·31	1·75	Emu Vale	2·81	47	1·60	2·83
					Jimbour	2·50	64	1·58	5·79
South Coast.					Miles	2·58	58	2·45	5·25
Biggenden	2·90	44	2·08	4·41	Stanthorpe	2·76	70	3·24	3·33
Bundaberg	2·79	60	3·45	7·66	Toowoomba	3·33	71	2·41	4·92
Brisbane Bureau ..	3·75	95	0·84	2·80	Warwick	2·66	78	1·91	3·24
Caboolture	3·51	67	2·13	7·41					
Childers	2·81	48	3·19	6·55	*Maranoa.*				
Crohamhurst	4·55	50	1·51	6·38	Roma	2·17	69	0·69	1·98
Esk	3·25	56	0·93	3·80	St. George	1·75	62	0·46	3·33

CLIMATOLOGICAL DATA FOR NOVEMBER.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	86	71	96	25	66	15	470	7
Herberton	..	85	59	93	15	48	26	570	10
Townsville	..	88	73	98	5	65	26	590	8
Rockhampton	29·91	86	65	95	10	55	19	424	12
Brisbane	29·95	79	63	90	4	57	12	280	12
Darling Downs.									
Dalby	..	83	55	91	22	47	6	711	12
Stanthorpe	..	74	52	85	22	39	6	333	12
Toowoomba	..	77	55	87	22	44	6	492	13
Mid-Interior.									
Georgetown	29·86	97	69	105	10	53	6	197	4
Longreach	29·88	95	67	105	9	57	5, 6	120	4
Mitchell	29·89	86	59	96	9	46	6, 11	355	8
Western.									
Burketown	..	99	82	107	11, 14, 16, 17, 18	61	6	161	4
Boulia	29·86	95	67	106	21, 30	57	5	18	3
Thargomindah	29·86	88	63	101	21	52	4, 5	188	5

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Commonwealth of Australia,
Meteorological Bureau, Brisbane.

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